| *Boll. Malacologico* | **27** (1991) | (10-12) | 149-248 | Milano 25-2-1992 |
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**Anders Warén***

# NEW AND LITTLE KNOWN «SKENEIMORPH» GASTROPODS FROM THE MEDITERRANEAN SEA AND THE ADJACENT ATLANTIC OCEAN**

KEY WORDS: Archaeogastropoda, Skeneidae, Trochaclididae, Heterobranchia, Xylodiscu-lidae n.fam., Mediterranean, Northeast Atlantic, systematics, new species, new genera.

## Riassunto

Vengono revisionati o riesaminati circa 150 taxa di microgasteropodi, inlcusi tradizionalmente nelle Cyclostrematidae, Skeneidae ed altre famiglie «skeneimorfe», soprattutto del Mediterraneo e dell'adiacente Oceano Atlantico. La revisione si basa sui tipi e su nuovo materiale e riguarda le famiglie degli Archaeogastropoda: Trochidae, Skeneidae, Trochaclididae e degli Heterobranchia Xylodisculidae n. fam.

Sono descritti i seguenti nuovi generi e specie: *Skeneoides* WARÉN gen, n. specie tipo *Delphinula exilissima* PHILIPPI, 1844 (Skeneidae); *Akritogyra curvilineata* WARÉN, gen.et sp. n.; *Anekes paucistriata* WARÉN sp. n.; *A. inflata* WARÉN nom. nov. per *Cyclostrema bithynoides* JEFFREYS, 1883 per omonimia; *Lissotesta major* WARÉN, n.sp.; *Granigyra granulifera* WARÉN sp.n.; *Lissomphalia* WARÉN, gen.n., specie tipo *Cyclostrema bithynoides* MONTEROSATO, 1880 (tutte sistemate, sia pur con incertezza, nella famiglia Skeneidae); *Trochaclis versiliensis* WARÉN, CARROZZA & ROCCHINI sp.n. (Trochaclididae); Xylodisculidae WARÉN, fam. n. (Heterobranchia); *Xylodiscula lens* WARÉN, sp.n.; *Xylodiscula boucheti* WARÉN, CARROZZA & ROCCHINI sp.n.

In appendice sono elencate altre variazioni di tassonomia (p. 191).

## Abstract

About 150 microgastropod taxa, traditionally included in Cyclostrematidae, Skeneidae and other «skeneimorph» families, mainly from the Mediterranean and the adjacent Atlantic Ocean, are revised or reviewed. The revision is based on types and new material. The following families are involved: Archaeogastropoda; Trochidae, Skeneidae, Trochaclididae, and Heterobranchia; Xylodisculidae fam.n.

The following new genera and species are described: *Skeneoides* WARÉN, gen.n., type species *Delphinula exilissima* PHILIPPI, 1844 (Skeneidae); *Akritogyra curvilienata* WARÉN, gen. et sp.n.; *Anekes paucistriata* WARÉN sp.n.; *A. sculpturata* WARÉN, sp.n. *A. inflata* WARÉN nom. nov. for *Cyclostrema bithynoides* JEFFREYS, 1883 because of homonymy; *Lissotesta major* WARÉN, sp.n.; *Granigyra granulifera* WARÉN sp.n.; *Lissomphalia* WARÉN, gen.n., type species *Cyclostrema bithynoides* MONTEROSATO, 1880 (all placed in Skeneidae, but family affinity is uncertain); *Trochaclis versiliensis* WARÉN, CARROZZA & ROCCHINI sp.n. (Trochaclididae); Xylodisculidae WARÉN, fam.n. (Heterobranchia); *Xylodiscula lens* WARÉN, sp.n.; *Xylodiscula boucheti* WARÉN, CARROZZA & ROCCHINI sp.n.

Other taxonomical changes are listed in an appendix (p. 191).

* Department of Invertebrate Zoology, Swedish Museum of Natural History, Boxo 50007, S-10405 Stockholm, Sweden.

** Lavoro accettato il 15 settembre 1991.

## INTRODUCTION

This paper consists of notes and observations on several groups of Mediterranean gastropods, accumulated during many years. The taxa discussed here have long been problematical in Mediterranean malacology (see e.g. GHISOTTI 1984).

The paper is partly based on specimens accumulated by Dr. P. BOUCHET, MNHN, from French deep-sea investigations around the European coasts, in some cases also from non-European areas. This material has been studied as a preparation for the fifth part of BOUCHET & WARÉN's series of revisions of the deep sea gastropods of Europe.

Another important collection that has been used extensively is the MARSHALL, later SYKES collection from the PORCUPINE and SHEARWATER Expeditions, now kept at BMNH (see WARÉN 1980:58-59).

The finding of new, well preserved shells of some of these species by FERDINANDO CARROZZA and ROMUALDO ROCCHINI, who sent these to WARÉN, contributed to the completeness of the paper.

The results are presented as a systematic section with comments on the taxa. At the end there is a list of some names that have not been adequately treated because of imperfect descriptions and knowledge, and lack of material. There is also a list of taxa of which the Mediterranean records are based on erroneous identifications.

Some little known species are treated with a full list of synonyms, type material, material examined, etc.; the more well known species are only briefly mentioned.

This paper is not complete regarding the Mediterranean «skeneimorphs»; a few taxa have recently been properly treated in various other papers and some are still awaiting the purgatory. *Adeorbis exquisitus* JEFFREYS, 1883 (= *Adeorbis imperspicua* CHASTER, 1895), *Adeuomphalus* SEGUENZA, 1876; *Palazzia* WARÉN, 1991, *Rugulina* PALAZZI, 1989b (= *Trachysma* AUCTT.); and *Eudaronia* COTTON, 1945 were discussed by WARÉN (1991). *Skenea pellucida* MONTEROSATO, 1874 and *Oxystele depressa* GRANATA, 1877 will be discussed by WARÉN & GOFAS (in prep.). MCLEAN (in press) is preparing a revision of the Choristellids. PONDER (1990b) referred *Cyclostremiscus dariae* LIUCCI & ZUCCHI STOLFA, 1979 to *Orbitestella* IREDALE, 1917, in the Orbitestellidae (Heterobranchia).

The authorship of the new taxa introduced here is to be quoted as in the respective headings.

In the lists of «material examined», the term «shell» refers to empty shells, «specimens» to live taken individuals with remaining, dried or preserved soft parts.

## ABBREVIATIONS

AMS -- Australian Museum, Sydney
BMNH -- The Natural History Museum, London.
IRSNB -- Institut Royal des Sciences Naturelles de Belgique, Bruxelles.
MCZ -- Museum of Comparative Zoology, Harvard University, Cambridge, Mass.

MD32 -- M/S Marion Dufresne cruise 32, around Réunion Island 1982, leader Alain Guille.
MNHN -- Museum national d'Histoire Naturelle, Paris.
NMV -- National Museum of Victoria, Melbourne, Victoria.
NORBI -- A joint French-Swedish deep-sea expedition in the Norwegian Sea, see Bouchet & warén 1979.
RMNH -- Nationaal Natuurhistorisch Museum, Leiden.
SEM -- Scanning electron microscopy
SMF -- Senckenbergisches Museum und Forschungsinstitut, Frankfurt a.M.
SMNH -- Swedish Museum of Natural History, Stockholm.
USNM -- U.S. National Museum of Natural History, Washington D.C.
ZMR -- Zoological Museum of the City of Rome.

## SYSTEMATIC PART

The higher classification and relations between the archaeogastropod families used in this paper have not been considered. The most recent reviews, Salvini-Plawen & Haszprunar 1987, Haszprunar 1988 and McLean 1990, distinguish two suborders, for the species discussed: Vetigastropoda (among the included superfamilies I deal with Trochoidea) and Seguenziina (Seguenzioidea). Some of the taxa used ahead (classified in Skeneidae) show more similarity to the Trochoidea in radular morphology, others resemble the Seguenziina (e.g. *Lissotesta*, *Moelleriopsis*), but none of the taxa in this paper were considered by the authors just listed. The reason for this neglect is the almost total lack of anatomical information. This led Marshall (1988), in a conservative approach, to classify six very diverse, genera in the Skeneidae. That manner is followed here.

I here want to draw attention to the Newcaledonian species of Seguenziidae which were treated by Marshall (1991) in a superb review of the extraordinary array of species found there during the last few years.

For the present review, I have mainly used shell, opercular, protoconch and radular characters since very little alcohol preserved material has been available (and even less, which has been properly relaxed). I did, however, examine the external morphology of some of the taxa involved and those observations have contributed to my opinions. These results will be published elsewhere.

The generic reviews in Wenz (1938) and Brookes Knight et al (1960) are almost solely based on shell characters, observed in rough drawings and should not be considered final.

Considerable steps forwards in the clarification of that mess have been taken by Ponder (1985, 1990a, b), Marshall (1988) and Hickman & McLean (1990).

The intention with this paper has mainly been to classify the species into monophyletic genera, and, when there exists an established, suitable family, classify them there. The result has been that several genera could not be classified in existing families; in those cases I have placed them in Skeneidae, without letting their inclusion influence the family concept.

## Subclass ARCHAEOGASTROPODA

### Family SKENEIDAE

*Diagnosis.* Small (0.8-5 mm) skeneimorph gastropods with a globular or flat spired shell with highly variable sculpture. Protoconch distinctly coiled, with 0.4-0.8 whorls, smooth or sculptured.

A pair of cephalic tentacles, neck lobes and several epipodial tentacles are present. Sensory papillae cover most of the surface of the cephalic and at least some of the other tentacles. The species are simultaneous hermaphrodites; the right anterior corner of the propodium carries a large penis of varying shape. The gill is monopectinate.

The radula is more than 2.5 times as long as broad, and has the formula: n - (2-6) - 1 - (2-6) - n. The transverse rows are more or less sigma shaped; the central plate is large, ovate, with or without cusps; the lateral teeth are robust, with strong cusps.

*Remarks.* HICKMAN & MCLEAN (1990) gave a historical review of the family and redefined it in a way similar to how it is used here, although some of the genera they included may not belong in Skeneidae (for example *Ganesa, Granigyra* and *Brookula*). Some information about the animal of *Skenea serpuloides* was presented by FRETTER & GRAHAM (1977) and WARÉN (1991) figured the shells and radulae of *Skenea serpuloides* and *Dikoleps pusilla* (type species of these genera). WARÉN & BOUCHET (in press) figures critical point dried animals of *Dikoleps*. The family, as used in current literature, still contains both hetero- and caenogastropods in addition to archaeogastropods of diverse origins.

I have examined the external morphology of the soft parts of most genera discussed here. Those results are briefly mentioned in the «Diagnosis» above and will be reported in more detail elsewhere. The presence of a propodial penis has been confirmed in species of *Dikoleps, Pseudorbis, Skenea, Lissospira, Lodderena*, and *Skeneoides*. It is absent in *Cirsonella, Akritogyra, Anekes, Trochaclis*, and *Granigyra*. I have not been able to examine this character in *Parviturbo, Lissotesta, Retigyra, Moelleriopsis* and *Lissomphalia*. This propodial penis is a unique structure; nothing similar is known in any other gastropod; and it is thus a good synapomorphy for keeping at least a part of the family together. Whether also species lacking such a reproductive organ can be classified here can only be decided when the origin of the group and similar genera are better known.

The species here included in the Skeneidae have a turbinid-like radula with more or less sigma-shaped transverse rows. The lateral supports of the central tooth are strongly expanded laterally and form an ovate, shield-like plate, frequently equipped with denticles along the edge between the cutting plates of the lateral teeth. The number of lateral teeth and their shape is variable, 2-5 on each side of the central tooth in the genera discussed here, up to 6 in other taxa. The marginal teeth are numerous, numbering more than 20 per cross row, claw-shaped with a serrated, apical part and a longitudinally

drawn out, flat, triangular base, that is most strongly developed in the innermost marginals.

The so-called lateromarginal plate (HICKMAN & MCLEAN 1990) is highly variable. In *Cirsonella* and *Skeneoides* it consists of an enlarged base of a marginal tooth, in *Parviturbo, Lodderena* and *Skenea* it is a free plate seemingly derived from a lateral tooth (Fig. 6A-B) through reduction of the cutting plate. In *Skenea (Lissospira) basistriata* (Fig. 46A-B) it is not differentiated, although the orientation of the outermost lateral tooth indicates that it may have the same function as a lateromarginal plate.

This difference in origin of the lateromarginal plate does, however, not necessarily prohibit close relationship since the differentiation of the marginal and lateral fields during the ontogeny (WARÉN 1990) will allow an increase or reduction in the number of lateral teeth and a displacement of the function of the plate.

## Genus *PARVITURBO* PILSBRY & MCGINTY, 1945

*Parviturbo* PILSBRY & MCGINTY, 1945:54. Type species, by original designation, *Parviturbo rehderi* PILSBRY & MCGINTY, 1945, intertidal, Florida.

*Remarks.* When describing the genus *Parviturbo* and its type species, PILSBRY & MCGINTY promised a future figure of the radula, but this was never published. HICKMAN & MCLEAN (1990) recently figured the radula (fig. 97A) and shell (fig. 95A) of a closely related species, *Parviturbo acuticostatus* (CARPENTER, 1864), from California. I have illustrated the radula (Fig. 2A) operculum (Fig. 4A) and shell (Figs 1A, 3A,) of the same species for comparison. The operculum is corneous and multispiral with short growth zone. This does not fit with a position in the Turbinidae where ABBOTT (1974) classified the genus, but for the present it seems best classified in the Skeneidae (HICKMAN & MCLEAN 1990).

The genus *Parviturboides* PILSBRY & MCGINTY, 1950 (Vitrinellidae) has a shell similar to that of species of *Parviturbo*. The animal of the type species, *P. interruptus* (C.B. ADAMS, 1850) was figured by MOORE (1962). Species of this genus can most easily be distinguished by having a taenioglossate radula and a larval shell consisting of protoconch 1 and 2, together comprising about 2.5 almost smooth whorls. I figure the shell and radula for comparison (Fig. 1C, 2B, 3C). It belongs to the Vitrinellidae (Truncatelloidea = Rissoidea).

ROLAN (1988) described a new species of *Parviturbo* from the Canary Islands, *P. insularis*. That species differs from *P. fenestratus* (see below) in having finer sculpture, with about a dozen spiral ribs, of which three are placed centrally to the main basal rib (only one in *fenestratus*), and by having more rounded whorls.

A third northeast Atlantic species, possibly belonging to *Parviturbo* is «*Cyclostrema sphaeroidea*» sensu JEFFREYS (1883a). It is only known from south of Portugal, from several hundred meters depth. (The relations to the fossil *Turbo sphaeroidea* S.V. WOOD, 1842 are uncertain, and since it is known only from empty shells, the systematic position remains doubtful too.) It differs from *P. fenestratum* in having finer sculpture with eight spiral ribs and a larger protoconch, diameter about 280 $\mu$m.

*Delphinula elegantula* PHILIPPI, 1844 seems to be a fourth species of *Parviturbo*. It is a Plio-Pleistocene fossil from Pezzo, in Calabria, southern Italy. I figure a specimen originating from the MONTEROSATO collection, now in SMNH (Fig. 1D, 3D).

These species may ultimately need a new genus since the tropical species of *Parviturbo* all live in shallow water and have dominant spiral sculpture (MCLEAN pers. comm.), but I find it unwise to introduce a new genus for the European species before any soft parts are known.

*Parviturbo fenestratus* (CHASTER, 1896)
(Figs 1B, 3B)

*Cyclostrema fenestratum* CHASTER, 1896:4.

*Type material*. Not seen.
*Type locality*. Bay of Tangier, Morocco, 13 m depth, in shell sand.

*Material examined*. Strait of Gibraltar, Ceuta, Punta Almina, 35°54.1'N, 05°16.5'W, 30-43 m, 2 shells, (MNHN); --PORCUPINE Exp. 1870, mixed stations in the Ibero-Moroccan Gulf, USNM 181414, 1 shell (with 3 *sphaeroidea*); --stn 56, 37°03'N, 11°36'E, 709 m, 1 shell; --stn 24, 37°19'N, 09°13'W, 530 m, 21 shells; --stn Tangier Bay, 61 m, 1 shell; --stn Adventure Bank, 167 m, 17 shells; SHEARWATER Exp. off Tripoli, 72-220 m, 1 shell (all in the SYKES collection, BMNH).

*Distribution*. Incompletely known, from North Africa and between Corsica and Sardinia (100-200 m) (BOGI & NOFRONI 1986). Depth range 13-200 m.

*Remarks*. In the MONTEROSATO collection there is a sample labelled «*Cyclostrema sphaeroidea*, Adventure Bank». The specimens were sent to MONTEROSATO by JEFFREYS and they belong to P. *fenestratum*.

SCHIRÒ (1971a) and BOGI & NOFRONI (1986) recorded «*Cyclostrema sphaeroidea* (WOOD, 1842)» from some Mediterranean localities, for example the Strait of Gibraltar and the Strait of Bonifacio, 50-200 m. Judging from BOGI & NOFRONI's figures, their record can not be *sphaeroidea* but must be *fenestratum*. SCHIRÒ's figure probably shows «*C. sphaeroidea*», but no locality is given for the specimen, which probably comes from the MONTEROSATO collection, and thus may be extra-Mediterranean.

«*Cyclostrema sphaeroidea*» can therefore not be considered reliably recorded from the Mediterranean.

Genus *SKENEA* FLEMING, 1825

*Skenea* FLEMING, 1825:246. Type species, subsequent designation GRAY (1847:152), *Helix serpuloides* MONTAGU, 1808, Great Britain.

*Delphinoidea* BROWN, 1827:32. Type species, subsequent designation Gray (1847:152), *Helix serpuloides* MONTAGU, 1808.

*Diagnosis*. Very small skeneimorph gastropods with almost planispiral, evenly and finely spirally striated shell, almost round, radial, prosocline

aperture and perfectly smooth protoconch. Radula with three lateral teeth and well developed lateromarginal plate. Propodial penis present.

*Remarks. Tubiola* A. Adams, 1863, has often been employed in a sense similar to *Skenea*, but is based on «*Turbo niveus pellucidus...*» (nonbinominal) Chemnitz (1788, pl. 165, figs 1587-88). The name was validated by Gmelin (1790:3598) as *Turbo niveus*. This species is much larger (about 13 mm) and seems to be identical with or closely related to «*Cyclostrema (Daronia)*» *subdisjuncta* H. Adams, 1868. I have examined radulae of similar species and they should be classified close to *Fossarella* Thiele, 1925 (see Warén & Bouchet 1988), in the Vanikoridae, which family thus becomes the systematic position of *Tubiola*.

*Skenea* (sensu stricto) can be used for one or two flat-spired Mediterranean species:
*Skenea serpuloides* (Montagu, 1808). Figured by van Aartsen et al. (1984, fig. 36) and Warén (1991, figs 2C,D; 8C, D): operculum and radula Figs 4B, 5A, 6A in the present paper.
*Skenea pelagia* Nofroni & Valenti, 1987, seems to be a valid species, judging from the description, but I have seen no actual specimens. It can provisionally be classified in *Skenea*.

*Skenea* is characterised by the flat shape of the shell, the circular, almost radial aperture, and flat peristome.

The genera *Lodderena*, *Skeneoides*, *Dikoleps*, and *Lissospira* can either be considered subgenera of Skenea or full genera; the species here placed in each of them are certainly more closely related within the group, but these constitute only a very small part of the world fauna and only increased knowledge about other taxa can solve this question.

## Genus *LODDERENA* Iredale, 1924

*Lodderena* Iredale, 1924:233. Type species, by original designation, *Cyclostrema minima* Tennison-Woods, 1878, southern Australia, shallow water (Figs 5C, 7C, 9A).

*Diagnosis.* Very small skeneimorph gastropods with almost planispiral, spirally striated shell with three or more, periumbilical, «scaly» ribs. Aperture almost round, radial and prosocline. Protoconch with deformed nucleus. Radula with four or five lateral teeth of which outer one may lack denticles and form a lateromarginal plate. Propodial penis present (in *L. catenoides*).

*Remarks.* The type species of *Lodderena* was discussed by Hickman & McLean (1990) and placed in a «microliotiform» group of the Skeneidae. *Lodderena minima* differs from *Lodderena catenoides* in having a strong labial varix (Fig. 7C), a typical character of many of the small turbinids, but the similarities in sculpture, protoconch, radula and operculum show beyond any doubt that the two species are congeneric. The operculum is corneous, fairly thick and stiff, with short growth zone (Hickman & McLean 1990).

The genus is also characterized by the very sharp, finely incised spiral furrows crossed by axial microlamellae (Fig. 9A).

I am aware of a single European species of *Lodderena*, *L. catenoides* (Mon-

TEROSATO, 1877), which was illustrated by van AARTSEN et al. 1984, fig. 37 and in the present paper (Figs 2C, 3F, 7D-F, 28E-F). A propodial penis is present in *L. catenoides*.

The differences from *Skenea* are not great and the two type species may eventually turn out to be congeneric.

## Genus *SKENEOIDES* gen.n. WARÉN

*Type species. Delphinula exilissima* PHILIPPI, 1844, Mediterranean, shallow water.

*Diagnosis.* Small, low-spired skeneids with strongly sculptured shell. 4-12 strong spiral ribs and numerous axial ribs. Microsculpture of axial lamellae and/or axially arranged granules. Radula with two lateral teeth on each side, inner one broad and flat, outer one hook-shaped. Innermost marginal tooth with large basal plate. Propodial penis present.

*Remarks. Dephinula exilissima* has previously been classified in *Skenea* and FEKIH & GOUGEROT (1977) placed it in *Munditiella* KURODA & HABE, 1954, the type species of which is «*Cyclostrema*» *ammonoceras* A. ADAMS, 1863, from Japan. I figure that species, since previous figures are inadequate (Figs 3E, 8A-C), and to emphasize my reasons for introducing *Skeneoides*. KURODA & HABE figured the radula, placed the genus in the Liotidae, and the protoconch clearly indicates that it is an archaeogastropod. I suppose the Skeneidae would be a better familial position (as suggested by BROOKES KNIGHT et al. 1960).

*Circulus formosissimus* was previously classified in *Pondorbis* BARTSCH, 1915, type species *P. alfredensis* BARTSCH, 1915, from South Africa. That genus was described in the Vitrinellidae, where BARTSCH also classified *Cyclostrema* MARRYATT, 1818. The systematic position of *Pondorbis* is uncertain, but the sigmoid growth lamellae do not support a position in the Skeneidae.

### *Skeneoides exilissima* (PHILIPPI, 1844)
(Fig. 5B, 8D-H, 9B)

*Delphinula exilissima* PHILIPPI, 1844:224.
*Cyclostrema dautzenbergianum* ANCEY, 1898a:149.
*Cyclostrema dautzenbergianum* ANCEY, 1898b:54.
*Cyclostrema subalveolatum* FEKIH & GOUGEROT, 1977:229
*Skenea exilissima*: -van AARTSEN & al. 1984:12

*Type material. D. exilissima*, not in Berlin; *C. dautzenbergianum*, syntypes in IRSNB; *C. subalveolatum*, syntypes in MNHN (Fig. 8D).

*Type locality. D. exilissima*, in sand at the Penninsula Thapsus, near Magnisi, Sicily; *C. dautzenbergianum*, Azeffoun, Algeria; *C. subalveolatum*, Tunisia, Tunis and Carthage.

*Material examined*: Spain, Ceuta, intertidal to 40 m, 10 shells and specimens, MNHN, SMNH; --Sicily, Acitrezza, 36 m, 40 shells, SMNH; --Sicily, Off Siracusa, 80-220 m, 1 shell, SMNH; --PORCUPINE Exp. Adventure Bank, 160 m, 2 shells, the SYKES collection in BMNH; --Portugal, Sagres, Bay of Baleeira, in-

tertidal, 3 specimens, SMNH; --Corsica, Baie de Calvi, algal wash, 10-20 m, 1 shell (SMNH).

*Distribution.* Recorded from several places in the western Mediterranean, in 0-100 m.

*Remarks.* PHILIPPI's drawing clearly shows the characteristic shape of this group of small skeneids. He also mentioned that the species has five spiral lines on the last whorl, visible on his drawing, which indicates that his species was based on the more coarsely sculptured form (see Fig. 8D).

The radula (Fig. 5B) differs from that of *Skenea* in having only two pairs of lateral teeth, both of which are simplified and more membranaceous, lacking lateral supporting ridges.

ANCEY (1898a, b) described his new species simultaneously in two separate papers, both dated «September». Presently there is no need to judge one of them as the «original description», since they evidently refer to the same species.

*Skeneoides jeffreysii* (MONTEROSATO, 1872)
(Figs 9C, 10A-D)

*Delphinula costata* DANILO, 1856;123.
*Circulus jeffreysii* MONTEROSATO, 1872:31 (nom.nov. for *D. costata* DANILO, 1856, not BRONN, 1827).
*Circulus formosissimus* BRUGNONE, 1873:12.
*Circulus jeffreysii*: -MONTEROSATO, 1875:23.
*Circulus formosissimus*: -BRUGNONE 1876:25.
*Munditiella formosissima*: -GHISOTTI 1977:193.

*Type material. D. costata*, not known; *C. formosissimus*, 1 shell, in ZMR, with BRUGNONE's label and the original figure.

*Type locality. D. costata*, Yugoslavia, Zara and Puntamica; *C. formosissimus*, Sicily, Cape San Vito.

*Material examined.* The type and: --PORCUPINE Exp. 1870, Adventure Bank, 160 m, 7 shells, SYKES collection, BMNH; --Sicily, Palermo, 2 shells, from MONTEROSATO in the SYKES collection, BMNH.

*Remarks. Skeneoides jeffreysii* differs from *exilissima* in having relatively stronger sculpture, especially the axial ribs.

BRUGNONE (1876) admitted that his name was published later than that of MONTEROSATO.

*Ammonicerina paucicostata* O.G. COSTA, 1861(:72), may be this species as PALAZZI & GAGLINI (1979:31) suggested, but it is more likely to be based on *exilissima*, especially since COSTA's specimen was said to be only 0.6 mm in diameter and at that size *exilissima* has as prominent a sculpture as *S. jeffreysii*.

*Delphinula costata* DANILO is actually not preoccupied by *D. costata* BRONN, 1827 since the latter was described as *Nerita costata* and now is classified in the Pyramidellidae *(Phasianema)*. However, MONTEROSATO proposed the replacement name well in advance of 1961, and DANILO's name is therefore permanently invalidated (ICZN article 59(b)1).

I have seen no live-taken specimens and have thus not been able to examine the radula.

## Genus *DIKOLEPS* Höisaeter, 1968

*Dikoleps* Höisaeter, 1968:47. Type species, by original designation, *Margarites pusilla* Jeffreys, 1847, Great Britain.

*Diagnosis.* Very small skeneimorph gastropods with depressed spire, spirally striated, smooth or axially wrinkled shell with periumbilical spiral ribs. Aperture almost round, radial, prosocline with distinct shallow sinus in profile of outer lip. Protoconch perfectly smooth. Radula with three to four lateral teeth. Propodial penis present.

*Remarks. Dikoleps* was transferred from Trochidae to Skeneidae by Warén (1991) and the Mediterranean species *D. pusilla* (Jeffreys, 1847); *D. nitens* (Philippi, 1844); *D. pruinosa* (Chaster, 1896); and *D. cutleriana* (Clark, 1849) (= *Trochus exilis* Philippi, 1844???) were illustrated by van Aartsen et al. 1984. They are restricted to fairly shallow water, although shells can be found at great depths. (See also comments on *Cyclostrema depressum* Monterosato, p. 183.)

«*Cyclostrema*» *umbilicostriatum* Brugnone Ms, Gaglini, 1987 seems to be based on a specimen of *Dikoleps nitens*. The type locality is Trapani, Sicily (holotype in ZMR).

*Skenea alderi* Jeffreys, 1867 and *Skenea forbesi* Nordsieck, 1982 («new name for *Skenea laevis* Forbes & Hanley, 1856, not Philippi, 1844») are synonyms of *Dikoleps pusilla* (Jeffreys, 1847), as far as I can understand from Jeffreys' and Forbes & Hanley's descriptions.

The only species of *Dikoleps* with deviating shell characters is *D. pruinosa* (Chaster) but it is probably closely related, as indicated by the identical shape of the teleoconch and larval shell. Nothing is known about the soft parts. I figure the shell (Figs 7A-B, 9D), to show the similarity to *D. pusilla*. The surface structure produces a dull sheen when examined under a stereomicroscope at low magnification. *Dikoleps pruinosa* was recorded from Ceuta by Ponder (1990a) and its shell and radula were figured. That record and the figures, however, seem to be based on specimens of *D. nitens* which had been slightly corroded by the interstitial water of the gravel beach where the specimens were collected. That is suggested by Ponder's figure of the protoconch, which has a rough surface in the illustrated specimen, though it is normally perfectly smooth. There is also a possibility that this is an undescribed species.

Philippi's (1844) name *Trochus exilis* seems to be based on the same species as *Dikoleps cutleriana* and is the older name. I am, however, not aware of any type material and the identification can be challenged, so I leave this possible change of names to mature.

The radula of *Dikoleps pusilla* was figured by Warén (1991); that of *D. cutleriana* differs in having a normally developed cutting edge on the central tooth (similar to *Skenea basistriata*, Fig. 46A-B) and a fourth lateral tooth resembling that of *Lodderena catenoides*, although less solid and equipped with a cutting edge.

*Cirsonella* Angas, 1877:38. Type species, by monotypy, *C. australis* Angas, 1877 (Fig. 11A), southern Australia.

*Tharsis* Jeffreys, 1883a:93 (not Giebel, 1847). Type species, by monotypy, *Oxystele romettensis* Granata, 1877, Mediterranean.

*Tharsiella* Bush, 1897:113. Replacement name for *Tharsis* Jeffreys, 1883 not Giebel, 1847.

*Porcupinia* Cossmann, 1900:43. Replacement name for *Tharsis* Jeffreys, 1883.

*Porcupina* Cossmann, 1925:287. Misspelling.

*Diagnosis.* Small skeneimorph gastropods with almost globular, smooth shell, almost round, prosocline aperture, with thickening at umbilicus. Protoconch finely and irregularly spirally striated. Operculum sturdy, yellowish with long growth zone. Radula with four to five undifferentiated lateral teeth and well developed basal plate on innermost marginal tooth. Propodial penis not present.

*Remarks. Cirsonella australis* Angas, 1877 (Fig. 11A) does not differ noticeably in shell characters from *Cirsonella extrema* Thiele, 1912, from the Antarctic (Figs 4D, 9F, 11B, 12B). I figure both species, and the radula of *C. extrema* for comparison (Fig. 12B). I can see no reason for keeping *Tharsiella* as a distinct genus. The conchological similarity was indicated by B. Marshall (1988:952), but he believed «Warén (personal communication)» to have said that *Tharsiella* has no radula. That statement in fact referred to *Rugulina* Palazzi, 1988.

Oliverio (1982, 1985, 1989) reviewed the Mediterranean species of *Tharsiella*, *T. romettensis* and *T. depressa*, their nomenclatorial history and distribution, but kept them both in *Tharsiella*, classified in the Skeneidae. Warén & Gofas (in press) will show that *T. depressa* actually belongs to the Heterobranchia. *Cirsonella romettensis* is an archaeogastropod.

The radula of *C. romettensis*, (Fig. 12A), is not very different from that of *C. extrema*, with well developed basal plates in the inner marginal tooth, five pairs of lateral teeth, and a very broad, unserrated central tooth with a distinct horizontal central ridge. It does not give any distinct clues about the position of the genus. The operculum of *Cirsonella* (Fig. 4C-D) differs from typical species of Skeneidae in having its last whorl slowly tapering over about 1/3 of a whorl, while in the Skeneidae it ends abruptly with an oblique edge covering about 1/20 of a whorl. It is also characteristic that species of *Cirsonella* retract the operculum only very shortly, or not at all, behind the peristome, contrary to most skeneids. Furthermore, there is no propodial penis. I therefore question if this genus is not more related to some of the turbinids where a similar radula and growth zone of the operculum are common. A formal transfer of the genus will, however, have to wait until more substantial evidence can be given.

*Cirsonella romettensis* (GRANATA, 1877)
(Figs. 4C, 9E, 11C-E, 12A)

*Turbo romettensis* SEGUENZA Ms, JEFFREYS, 1874:113 (nom. nud.).
*Turbo romettensis* SEGUENZA, 1875:23 (nom. nud.).
*Turbo romettensis* SEGUENZA, 1876(June):182 (nom. nud.).
*Oxystele romettensis* GRANATA, 1877a:146 (nom. nud.).
*Oxystele romettensis* GRANATA, 1877b:5.
*Tharsis romettensis* JEFFREYS, 1883a:93.
*Cithna adamsi* JEFFREYS, 1883a:111.
*Cyclostrema funnazzensis* de GREGORIO, 1889:285.

*Type materials. O. romettensis* [GRANATA], not known; *C. adamsi*, see WARÉN 1980; *C. funnazzensis*, not known.

*Type localities. O. romettensis* [GRANATA], Pliocene(-Pleistocene) of Italy and the Recent Mediterranean; *C. adamsi*, off Portugal, PORCUPINE Exp. 1870, stations 16, 17, 17a, 1000-2000 m; C. *funnazzensis*, Sicily, Funnazzi, 136 m.

*Distribution.* Common from the Bay of Biscay, south to the Mediterranean, usually in 100 - 1000 meter, occasionally to 2000 m.

*Remarks.* WARÉN (1980) overlooked the earlier description of *T. romettensis* by GRANATA and considered JEFFREYS the author.

JEFFREYS (1883a) based the description of *Cithna adamsi* on young specimens of *C. romettensis* and I figure a syntype (Fig. 11E). Such young specimens lack the thickened inner lip, they have a deep suture, and strong spiral ribs in the umbilicus. At this stage and younger (Fig. 11C) they are difficult to distinguish from *Skenea (Lissospira) basistriata* and no identification should be made without access to a good growth series, or a careful examination of the protoconch, which is 250-290 μm in diameter in *C. romettensis* and 400-550 μm in *S. basistriata* (Fig. 47A-B and see p. 185).

Genus *PSEUDORBIS* MONTEROSATO, 1884

*Pseudorbis* MONTEROSATO, 1884:109. Type species, by monotypy, *Fossarus granulum* BRUGNONE, 1873, Mediterranean.

*Remarks.* I have not seen any specimens with remaining soft parts, which could be used for a radular preparation, but RUBIOSALAZAR & RODRIGUEZ BABIO (1990) transferred *P. granulum* to Skeneidae based on radular evidence. SALAZAR has since sent me SEM prints of the radula, and I agree with his conclusion. (See also p. 192)

*Pseudorbis granulum* (BRUGNONE, 1873)

*Fossarus granulum* BRUGNONE, 1873:13.

*Type material.* Numerous syntypes, labelled «Trapani» by BRUGNONE, in ZMR.

*Type locality.* The sea at Trapani, Sicily.

*Material examined.* The type material and some scattered specimens from Sicily in various museum collections.

*Distribution.* Sicily, deep water in the Sicilian Channel (CARROZZA 1983), Isle of Alboran 30-40 m (F. RUBIO SALAZAR, personal communication).

*Remarks.* This little, rare species offers no problems with its identification, except that it has rarely been figured, and I therefore figure it (Fig. 40E).

## Genus *AKRITOGYRA* n. gen. WARÉN

*Type species. Akritogyra curvilineata* n.sp.

*Etymology.* Akritos - confused, gyros - whorl, turn (Greek).

*Diagnosis.* Small archaeogastropods with a smooth, fragile skeneimorph shell. Protoconch of 0.5-0.6 whorls, finely granulate, at least on initial part. First 0.1 - 0.5 teleoconch whorl often sculptured with irregular net-sculpture or by short lines representing obsolete net-sculpture, or smooth. Beside this, only incremental lines and a slightly uneven, irregularly pitted surface in umbilicus (just barely visible with a stereomicroscope). 2-2.5 convex teleoconch whorls. Radula (4-6) - 2 - 1 - 2 - (4-6). Central tooth stout, with straight cutting edge, large central cusp and 3-5 denticles on each side, lateral supports strongly projecting. Innermost lateral tooth triangular with single cusp close to central tooth. Outer lateral tooth claw-shaped with reinforcing ridge on shaft surface. Large apical cusp and a smaller inner cusp somewhat below on inner side. Marginals 4-6, similar to 2nd lateral tooth, but only half as broad and equipped with small, longitudinally drawn out basal plates.

*Remarks.* The *diagnosis* above is based on *A. simile, A. conspicua* and *A. curvilineata*.

The radula differs from most archaeogastropod radulae in having few marginal teeth, only two pairs of lateral teeth and a central tooth which is more similar to that of mesogastropods. All tentacles lack sensory papillae and the propodium has no penis in *A. simile*. It is thus very unlikely that *Akritogyra* belongs to the Skeneidae, but since there is no other family available I have placed the genus in the Skeneidae, awaiting a more proper basis for the classification.

«*Cyclostrema*» *simile* JEFFREYS, 1883a (Fig. 13E-F, 14A-B, 15C) is closely related to *A. conspicua* (average diameter of shell about 2.0 mm instead of 1.4 mm as in *A. conspicua*), has a larger larval shell, 300 $\mu$m instead of 250 $\mu$m and has a taller spire. JEFFREYS (1883a) and J.T. MARSHALL (in the SYKES collection, BMNH) included several species under this name.

Following my (1980) idea about the interpretation of *C. simile* I have selected a specimen (USNM 181420, Fig. 14A), originally determined «*Cyclostrema affine*» by JEFFREYS (1883a) from the TRAVAILLEUR Expedition 1881 (Bay of Biscay), as neotype of *C. simile* (depth said to be 1685 m, but no station has that depth in the station lists). Specimens from this lot (USNM 181420 and 869482) agree with the original description in all details, especially in being almost smooth. The same species seems to be present in the original type material, although the specimens are in too poor a condition to be reliably identi-

fied. Most other specimens labelled «*C. simile*» by JEFFREYS have some distinct axial sculpture, or a shape different from the figure, or are too fragmentary to be identified. This type designation is done in accordance with ICZN Article 75biii and Recommendation 75E, to clarify the status of the name.

The soft parts were examined of one specimen of *A. simile*, from off northwestern Morocco, BALGIM st 91, 34°22.3'N, 07°25.1'W, 948 m. The snout is long and slender, distally bifid to half its length. The cephalic tentacles are slender and tapering, slightly longer than snout and lack sensory papillae. The eye lobe is a short claviform appendage, 1/4 the length and 1/3 the breadth of the cephalic tentacle. The left neck lobe consists of a thin membrane with at least two small tentacles; the right one is membranaceous, with one tentacle of half the length of the cephalic ones, close to eye lobe. Several epipodial tentacles are present on each side, also lacking sensory papillae. Foot large, anteriorly with drawn out corners; posteriorly deeply bifid. Operculum very thin, colour-less, with short growth-zone. Gill monopectinate.

*A. similis* is not known from the Mediterranean. NORDSIECK's (1982) record of «*Skenea similis*» from Salou near Tarragona, eastern Spain, is based on a freshwater snail (Fig. 14E).

«*Cyclostrema*» *affine* JEFFREYS, 1883 is here considered to belong to *Anekes* and is discussed further under that genus.

*Akritogyra curvilineata* WARÉN, sp.n.
(Figs 4F, 13A-D, 15A, 16A-B)

*Type material.* Holotype and 1 paratype in MNHN, 1 paratype SMNH 4931.

*Type locality.* Bay of Biscay, THALASSA stn Z447, 48°47'N, 11°13'W, 1430-1550 m.

*Material examined.* The types and --off northeastern Iceland, 66°20'N, 12°39'W, 15 Jul 1980, 197-228 m, leg. J. Bogason, 1 young specimen; --off western Portugal, PORCUPINE Exp. stn 17, 39°42'N, 09°43'W, 1993 m, 1 shell, BMNH.

*Distribution.* Only known from the material examined, from Iceland to southwestern Portugal in 200-2000 m depth; not known from the Mediterranean.

*Description.* Shell small, skeneiform, transparent, colourless and smooth. Protoconch (Fig. 15A) consisting of about 0.5 whorls, sculptured by a fine granulation on initial part; diameter 300 $\mu$m. Holotype with 2.5 strongly convex teloconch whorls. First 1/7 whorl sculptured by very short and thin, randomly scattered riblets of mainly spiral orientation, only visible with SEM. Later parts smooth except for distinct, close set, flexous growth lines. Umbilical area with scattered, small, shallow, irregularly distributed pits. Aperture almost circular, connected to preceding whorl for a very short distance. Umbilicus deep and wide.

*Dimensions.* Diameter (holotype) 2.28 mm, height 2.00 mm, height of aperture 1.26 mm, breadth 1.22 mm.

*Operculum.* (Fig. 4F.) Thin and multispiral, growth-zone short.

*Radula.* (Fig. 16A-B) (4-6) - 2 - 1 - 2 - (4-6), rather short and broad. Marginal teeth claw-shaped with a few small barbs along main cusp and small basal plates, drawn out anteriorly. Outer lateral tooth claw-shaped with a central reinforcement rib, with large main cusp and one or two additional barbs on each side. Inner lateral tooth broad, triangular, with a centrally directed main cusp. Central tooth stout with lateral supports, which together with back of tooth articulate with inner lateral tooth. Cutting surface short and broad, with a main cusp and 4 or 5 lateral denticles.

*Remarks.* This rather featureless species can be recognised by the distinctly flexuous, crowded incremental lines. The specimen from Iceland is young, it lacks the characteristic sculpture on the initial part of the teleoconch (but the surface appears corroded), and the identification is uncertain.

*Akritogyra conspicua* (Monterosato, 1880)
(Figs 14C-D, 15D-F)

*Cyclostrema conspicuum* Monterosato, 1875:23, nom. nud.
*Cyclostrema conspicuum* Monterosato, 1878:20, nom. nud.
*Cyclostrema conspicuum* Monterosato, 1880:66.
*Tubiola (Tubiola) conspicua*: - Schirò 1971c:6.
*Cyclostrema valvatoides*: - Di Geronimo & Bellagamba 1986:plate 2, figs 1-2 (not Jeffreys, 1883).
*Cyclostrema conspicuum*: - Gaglini 1987:5.

*Type material.* Many syntypes in ZMR.
*Type locality.* Sicily, close to Palermo and Ustica, «in great depth».

*Material examined.* The type material and --off southern France, Biomede 1976, stn 01, 42°59'N, 06°00'E, 1050-1200 m, 13 shells, MNHN; --stn 02, 42°40'N, 06°00'E, 2370-2420 m, 7 shells, SMNH; --stn 15, 42°53'N, 06°10'E, 1500-1600 m, 4 shells, MNHN; --Corsica, off Baie de Calvi, 70-150 m, 1 shell, SMNH.

*Distribution.* The central and western Mediterranean at 100-2400 m depth.

*Remarks.* Monterosato briefly described this species with the words: «similar in shape and size to *C. [yclostrema] basistriatum* Jeffr. which is Norwegian, but completely smooth instead of striated and with deeper suture.»
Schirò (1971c) gave three figures under the name *Tubiola (Tubiola) affinis*, which may be based on *A. conspicua*.
Gaglini (1987, fig. 8) figured two specimens from the Monterosato collection as «*Cyclostrema conspicuum*».
Bogi (1987:237) recorded and figured «*Cyclostrema affine*» from off Capraia and Cap Corse 180-400 m. The figure is as good as can be expected with light photography, but does not show all characters necessary for determination. The same species was, however, also reported from Palermo (on the authority of Monterosato) in the original description by Jeffreys. It is very likely that Bogi's two records are based on *A. conspicua*.

«*Cyclostrema*» *valvatoides* JEFFREYS, 1883a attains larger dimensions, has a more solid shell, and strong spiral striation on the protoconch. I figure the holotype for comparison (Figs 14F, 15B). Its systematic position is uncertain. NORDSIECKS's (1982) record from Ibiza (material now in SMF) is based on several young naticids and the species can thus be deleted from the Mediterranean faunal list.

## Genus *ANEKES* BOUCHET & WARÉN, 1979

*Anekes* BOUCHET & WARÉN, 1979:221. Type species, by original designation, *Anekes unduliscupta* BOUCHET & WARÉN, 1979, Arctic, abyssal.

*Diagnosis.* Very small, tall-spired, skeneimorph gastropods with exquisite sculpture of raised, irregularly branching or anastomosing lines, usually of mainly spiral direction. Protoconch with granular sculpture. Radula (ca 1-5) - 2 - 1 - 2 - (ca 5-1). Inner lateral tooth low and triangular, outer one claw-shaped. Central tooth stout with strong anterolateral supports. Tentacles with sensory papillae; no propodial penis.

*Remarks.* The type species was described from deep water in the Norwegian Sea and I have seen no specimens from further south. The Mediterranean species of Anekes were recently reviewed by BOGI & NOFRONI (1989), but most of the species there referred to *Anekes* are here placed in other genera.

The radula of the type species (Fig. 17B-C) passes through profound ontogenetic changes when the animal has reached about 2/3 of adult size. When young (Fig. 17C) the radula has the formula ca 10 - 2 - 1 - 2 - ca 10. The marginal teeth are claw-shaped with very small basal plates and a few small apical hooks. The second lateral tooth dominates the radula, tall, slender, and claw-shaped with an apical main- and two or three smaller lateral cusps. The first lateral tooth seems to be lost. The central tooth is rather thin and membranaceous with a denticulated cutting edge, a prominent central cusp and laterally expanding, membranaceous, supporting ridges.

Adult specimens (Fig. 17B), have the formula 1 - 3 - 1 - 3 - 1. The central tooth is sturdy with well developed lateral supports and has 9-10, very long and slender cusps on each side of the main cusp. The first lateral tooth is low, somewhat roundedly triangular, membranaceous and equipped with about a dozen subequal, slender cusps along the central 2/3 of the cutting edge. The second lateral tooth is comb-like, with an apical «claw» and about 14 denticles of equal size along the apical, straight half of its length. Just below the most basal denticle, the shaft is distinctly bent. The third lateral tooth is shorter than the second one, 2/3 of its length, more narrow, has 6-8 denticles and its apical part is bifurcated. The single marginal tooth present has a flat, rather broad basal part, the distal 2/3 are more slender and finely serrated

The interpretation of the radula is not final and the division into marginals and laterals should not be used for systematical purposes. The formula may as well be 3 - 1 - 1 - 1 - 3.

No other species of *Anekes* has been available for examination of the radular ontogeny.

«*Cyclostrema*» *affine* JEFFREYS, 1883a was described from the PORCUPINE

Expedition 1870, stations 16, 17, 17a, 27, 28, all from deep water, and the name was intended for a «very numerous» species. It was said to be smooth, but actually it has a very fine irregularly branching and anastomosing net-sculpture (Figs 18A-B, 19A). This sculpture can be seen in the original figure. I have seen no live taken specimens but from the sculpture it can provisionally be placed in *Anekes*.

*Anekes affine* differs from the species discussed ahead by its broader shape and by having the fine riblets arranged in a more distinctly netted pattern. To stabilize this name I have selected a lectotype USNM 181422 (paralectotypes now USNM 869481), from the PORCUPINE Expedition 1870 stn 17 (Fig. 18B).

«*Cyclostrema*» *bithynoides* JEFFREYS, 1883a is another species from deep water off Portugal. The description was based on a single, half-grown shell (Fig. 18C-D, 19B). Since the name is preoccupied by *Cyclostrema bithynoides* MONTEROSATO, 1880, I rename it *Anekes inflata* nom. nov.

«*Skenea bythinoides* (JEFFREYS, 1883)» (sic!) was recorded by NORDSIECK (1982) from Tarent, Italy, and from San Antonio, Ibiza. Examination of NORDSIECK's specimens (in SMF) revealed the true identity, namely *Paludinella littorina* (DELLE CHIAJE, 1828) (Assimineidae). The species can therefore be deleted from the Mediterranean species list.

*Anekes paucistriata* WARÉN, sp. n.
(Figs 19D, 20B-D, 21A, 22B)

*Type material.* Holotype SMNH 4341, numerous paratypes in MNHN and SMNH 4342.

*Type locality.* Gorringe Bank, SEAMOUNT CP20, 36°33.7'N, 11°30.1'W, 305-320 m, 14 specimens, several hundred shells.

Material examined. The type material and --off southern and southwestern Portugal, PORCUPINE Exp. 1870 stn 27, 36°37'N, 07°33', 586 m, 5 shells, SYKES collection, BMNH; --Gorringe Bank, SEAMOUNT Exp., stn DW06, 36°30.29'N, 11°37.9'W, 250 m, 1 shell; --stn DW08, 36°28.5'N, 11°37.1'W, 470-485 m, 14 shells; --stn DE09, 36°31.5'N, 11°38.0'W, 350-360 m, 11 shells; --stn DE10, 36°27.4'N, 11°35.0'W, 500-545 m, 3 shells; --stn DW15, 36°33.4'N, 11°28.8'W, 300-330 m, 57 shells; --stn DW16, 36°33.1'N, 11°32.5'W, 255-265 m, 46 shells; --stn DW21, 36°34.9'N, 11°28.43'W, 460-480 m, 2 specimens, 3 shells; --stn PK22, 36°31.8'N, 11°30.5'W, 50 m (170 m above bottom), 1 specimen; --Josephine Bank, stn DW38, 36°41.5'N, 14°17.0'W, 235-245 m, 35 shells; --stn DW39, 36°40.3'N, 14°16.3'W, 207-222 m, 1 specimen, 5 shells; --stn DW43, 36°44.9'N, 14°17.3'W, 260-285 m, 19 shells; --stn DW45, 36°45.8'N, 14°17.5'W, 315-335 m, 19 shells; --stn DW60, 36°43.1'N, 14°17.3'W, 240-255 m, 1 specimen; --stn DW61, 36°40.2'N, 14°16.0'W, 200-205 m, 43 shells; --Seine Bank, stn DE80, 33°48.5'N, 14°22.6'W, 250-256 m, 5 shells; --stn DE82, 33°47.7'N, 14°24.1'W, 320-400 m, 7 shells; --stn DE84, 33°48.2''N, 14°24.2'W, 450-455 m, 1 shell; --Ampere Bank, stn DE98, 35°03.2'N, 12°55.4'N, 300-325 m, 2 specimens, 100 shells (all material in MNHN and SMNH); -- Mediterranean, PORCUPINE Exp. 1870 stn Adventure Bank, 167 m, 2 shells, coll. SYKES, BMNH.

*Distribution.* The seamounts off southwestern Portugal in about 200-500 m and the Mediterranean, ca 150 m depth.

*Description.* Shell small, *Obtusella*-like, transparent, glossy and colourless, bluntly conical. Larval shell (Fig. 19D) consisting of 0.6 whorl, diameter 210 $\mu$m, sculptured by numerous small granules, more crowded at initial part of protoconch. Teleoconch with up to 3-3.5 convex whorls. First whorls sculptured by numerous small anastomosing and intersecting riblets of axial and spiral orientation. After first teleoconch whorl these become more sparse and are replaced by a few scattered, oblique riblets on adapical 2/3 of whorls and 2-4 randomly interrupted and restarting spiral lines just below periphery. Umbilicus narrow and deep, with coarse spiral sculpture of irregularly undulating riblets. Aperture radial, evenly rounded; outer lip sigmoidal, prosocline.

*Dimensions.* Height of holotype 1.44 mm, diameter 1.04 mm, height of aperture 0.70 mm, breadth 0.60 mm.

*Operculum.* Multispiral, thin, colourless, indistinctly sculptured, growth zone short.

*Radula.* (Fig. 21A) 3 - 2 - 1 - 2 - 3. Central tooth with 5 denticles on each side of main cusp and strong lateral supports. Inner lateral tooth rather small, roughly rounded triangular with single apical cusp. Outer lateral tooth claw-shaped, with a strong reinforcing rib centrally on anterior surface, 1 inner and 3 outer denticles beside main cusp. Marginals with 2-3 denticles on each side of main cusp and equipped with longitudinally flattened and expanded basal plates.

*Soft parts.* (From a living specimen, Ampere Bank.) Tentacles long and slender with sensory papillae. Snout deeply bifid, half the length of the tentacles. Eye lobes 1/3 length of cephalic tentacles, with large black eyes. Right neck lobe membranaceous, with two tentacles of which anterior one lacks sensory papillae. Left neck lobe with two setose tentacles. Four epipodial tentacles on each side of which second one is much shorter, club-shaped, pigmented with red and lacks sensory papillae. Foot large, anteriorly deeply bifid; posteriorly, less deeply bifid.

*Remarks. Anekes paucistriata* differs from *A. sculpturata* in its flexuous outer lip, sculptural arrangement and by having a higher and more slender spire. It may easily be confused with some of the small, smooth rissoids unless the surface is carefully examined for the distinctive riblets.

Surprisingly, one specimen (Fig. 20D) was taken in a plankton net about 170 m above the sea-bottom. The specimen was alive when brought onboard. The distance from the bottom precludes the possibility that the net might have touched it, since the length of the wire was less than half the distance to the seafloor.

Although I cannot rule out the possibility that the two shells from Adventure Bank have been mislabelled, the labelling of Sykes' and Marshall's material is generally much more reliable than those parts of the material of the Porcupine Expedition that were worked on by Jeffreys.

*Anekes sculpturata* WARÉN, sp. n.
(Figs 17A, 19C, 20A, 22A, 28A)

*Anekes undilisculpta*: -BOGI & NOFRONI 1989:142 (misspelling) (not BOUCHET & WARÉN, 1979).

*Type material.* Holotype and 2 paratypes in MNHN, 1 paratype SMNH 3656.

*Type locality.* Southeastern Bay of Biscay, 44°36'N, 02°08'W, 230-330 m.

*Material examined.* The types and --southeastern France, off Banyuls, Rech Lacaze, 270-254 m, 10 shells, SMNH; --southeastern Bay of Biscay, 44°00'N, 02°10'W, 280-300 m, 1 specimen, MNHN.

*Distribution.* From the Bay of Biscay to the Mediterranean, in 200-400 m.

*Description.* Shell very small, resembling *Obtusella* (Rissoidae), bluntly conical, perfectly transparent, vitreous but not very glossy. Protoconch (Fig. 19C) with 0.6 whorls, diameter 220 μm, sculptured with numerous small granules, more crowded at nucleus. Teleoconch with up to 2.4 strongly convex whorls with very deep suture. Initial 0.5 teleoconch whorl sculptured by very short anastomosing, crossing and branching, axial and spiral riblets. Riblets on last 1.5 whorls predominantly spirally oriented and mostly branching. Intermediate part of teleoconch with transitional sculpture. Similar, though more crowded, sculpture in narrow, deep umbilicus. Aperture orthocline, radial, perfectly round, in contact with preceding whorl for very short distance.

*Dimensions.* Height of holotype 1.06 mm, diameter 0.91 mm, height of aperture 0.52 mm, breadth 0.52 mm.

*Operculum.* (Fig. 28A) very thin, transparent, coiling hardly perceptible.

*Radula.* (Fig. 17A) 4 - 2 - 1 - 2 - 4. Central tooth with one main and three smaller lateral cusps, and strong lateral supports. First lateral tooth broadly triangular with a small cusp. Second lateral tooth tall and claw-shaped with two outer and a single inner cusp in addition to apical main cusp. Marginal teeth 1/3 of width of outer lateral, with two small denticles on outside of main cusp, bases slightly expanded longitudinally.

*Remarks.* BOGI & NOFRONI (1989) recorded and figured *A.* «*undilisculpta*» from the Tuscan Archipelago, 300-440 m. Their figure shows that their record is based on this new species.

*Anekes unduliscupta* differs from *A. sculpturata* by having about 0.4 whorls less at a comparable size. At 0.85 mm height *A. sculpturata* has 2.4-2.5 teleoconch whorls, *A. undulisculpta* has 2.0-2.1 whorls. The sculpture of the first teleoconch whorl at *A. undulisculpta* is mainly spirally oriented, while in *A. sculpturata* it is very irregular. Furthermore, the radulae are quite different, as can be seen from Figs 17A and C.

Genus *RETIGYRA* WAŔEN, 1989

*Retigyra* WARÉN, 1989:6. Type species, by original designation, *Cyclostrema millipunctata* FRIELE, 1886, North Atlantic, deep water.

*Diagnosis.* Very small, low-spired, skeneimorph gastropods with exquisite sculpture of raised lines forming a uniform rhombic pattern. Protoconch with granular sculpture. Radula ca 5 - 2 - 1 - 2 - ca 5. Inner lateral tooth low and triangular, outer one claw-shaped. Central tooth stout with strong lateral supports.

*Remarks.* To give a better foundation for the systematic position of this genus and for «*Homalogyra*» *granulosa* SYKES, 1925, I figure the radula and shell of a species from southwest of Iles Glorieuses, which is virtually identical with SYKES' species in shell characters (Figs 19F, 21B, 22F).

The radula (Fig. 21B) is morphologically similar to that of *Akritogyra* and *Anekes*, but the system of interaction between the teeth is more complicated. The first lateral tooth locks into a slit formed between the base of the lateral supporting ridge and the back of the central tooth. The second lateral tooth interlocks with the first lateral with its lateral supporting ridge, which is twisted centrally instead of laterally, as is usual, to fit into a slit between the corresponding lateral support and the back of the first central. The bases of the marginal teeth do not form conspicuous plates.

The very neat and uniform sculpture of variously compressed rhombic surfaces demarcated by sharp, raised lines seems to be restricted to *Retigyra*, but there are undescribed species of *Rugulina* that approach it, although their sculpture is never as symmetrical as in *Retigyra*.

Another species belonging to *Retigyra* is «*Cyclostrema*» *iheringi* DAUTZENBERG & FISCHER, 1897, from the Azores.

*Retigyra granulosa* (SYKES, 1925)
(Figs 19E, 22C-E)

*Homalogyra granulosa* SYKES, 1925:192.

*Type material.* Neotype, here selected (Fig. 19E, 22D-E), in BMNH.

*Type locality.* Off southwestern Portugal, Gorringe Bank, SEAMOUNT stn CP30, 36°44.3'N, 11°23.0'W, 1940-2075 m.

*Material examined.* The neotype and the fragments of SYKES' original shell.

*Distribution.* West and southwest off Portugal, 1000-2000 m depth, not known from the Mediterranean.

*Remarks.* Very little remains of SYKES' original specimen, which had been crushed, but I figure a fragment of it (Fig. 22C) to show that his description of the sculpture («fine coniform granules arranged in regular order») is not correct. The fragment shows nothing of the development of the spire, which is the main species distinguishing character of *Retigyra* and it is much too small to allow any conclusions about the shape of the aperture.

*Retigyra granulosa* was originally described from off western Portugal, PORCUPINE Expedition stn 17, 39°42', 09°43'W, 1993 m.

The neotype comes from a locality with a fauna very similar to the famous stations 16-17-17a of the PORCUPINE Expedition 1870, where many of JEFFREYS' (1883a) new species were found.

The shell of the neotype is thin and fragile, almost planispiral, covered by

an exquisite sculpture of lines demarcating symetrically arranged rhombic shapes. The whorls are almost circular in cross section and are scarcely in contact with the preceding whorl.

## Genus *LISSOTESTA* Iredale, 1915

*Lissotesta* Iredale, 1915:442. Type species, by original designation, *Cyclostrema micra* Tennison-Woods, 1877, Tasmania (Figs 24E, 25A-B).

*Intortia* Egorova, 1972:386. Type species, by original designation *I. homocostata* Egorova, 1972, Antarctic, 15-50 m (new synonym).

*Diagnosis.* Very small, globular gastropods, usually with a characteristic larval shell covered by an outer coating of, usually, finely granular, calcium carbonate which makes the suture almost invisible, except by transparency. 2-3 well rounded teleoconch whorls and a deep umbilicus with internal ridges. Radula with central tooth, one small inner and a larger outer lateral tooth and about five, basally united, flagelliform marginals.

*Remarks.* The diagnosis above covers fairly well the species included here, except that there is a variation in the spiral sculpture, from strong and consisting of several ribs all over the whorls, to almost perfectly smooth whorls. The radula is described in more detail under *L. major*.

The type species of *Lissotesta* has never been well figured and accordingly I figure two syntypes from AMS (Fig. 24E, 25A-B). The genus was previously placed in the Skeneidae (as a synonym of *Cirsonella* (Wenz 1938:329)). The radula is not known for the type species, but I have examined the radulae of two of the Antarctic species (*L. notilis* and *L. liratula*). Their radulae are very similar to that of the new species described below.

In addition to the European species listed here, there are several Antarctic and southern species that belong to this genus:
*Submargarita strebeli* Thiele, 1912
*Submargarita similis* Thiele, 1912
*Submargarita impervia* Strebel, 1909
*Margarita notilis* Strebel, 1909
*Submargarita mamillata* Thiele, 1912
*Submargarita unifilosa* Thiele, 1912
*Cyclostrema humile* Pelseneer, 1903
*Cyclostrema liratulum* Pelseneer, 1903

*Lapidicola* Egorova, 1972 (type species *L. gyratum* Egorova, 1972, Antarctic, 15-40 m) has a shell very similar to the species of *Lissotesta*, but has a different, probably paedomorphic radula.

Four European species are here included in *Lissotesta*, but I have examined additional undescribed species from off western Europe. They fit well the above diagnosis, and the major differences between the various species are the development and arrangement of the spiral sculpture.

*L. minima* (Seguenza, 1876) is here included in *Lissotesta* although it does not fit and will probably need a new genus when this group is better known. Presently I hesitate to propose a new genus for this featureless shell, which I place in *Lissotesta* because it has a similar umbilicus and shape.

A very characteristic feature of the species of *Lissotesta* is the protoconch

(Figs 25D, 26A-B), which is large and swollen, dome-shaped, usually with a granular sculpture and lacking almost every trace of coiling. This type of protoconch occurs in several «skeneimorph» genera, *Lissotestella* POWELL, 1946; *Notosetia* IREDALE, 1915; *Aequispirella* FINLAY, 1927; and at least one undescribed species of typical seguenziid (similar to *Carenzia* QUINN, 1983) from off Queensland.

The invalid family name Brookulidae has previously been used (IREDALE & MCMICHAEL 1962) for some genera of small, related archaeogastropods, but the shell characters of the type species of *Brookula*, *B. stibarochila* IREDALE, 1915 (Fig. 23A-B), are more similar to certain species best included in the Eucyclinae (sensu HICKMAN & MCLEAN 1990, see also discussion about *Vetulonia* in WARÉN & BOUCHET in press). No soft parts have been available for checking the radular morphology of *Brookula*. The genus *Benthobrookula* CLARKE, 1961 (type species *B. exquisita* CLARKE, 1961 from off South Georgia, 3700 m depth) is probably related to *Lissotesta* and congeners, since it has the same type of protoconch.

I do not know if this type of protoconch is a synapomorphy of these genera, or if it has a purely functional background, i.e. it is caused by some modification in the larval development. In the latter case it is likely to appear in unrelated taxa.

*Lissotesta major* sp.n.
(Figs 24A-D, 25C-D, 27A, 28B)

*Type material.* Holotype and 15 paratypes from the SYKES collection, BMNH.

*Type locality.* PORCUPINE Exp. 1870, stn 17, west of Portugal, 39°42' N, 09°43'W, 1993 m.

*Material examined.* The types and --INGOLF Exp. stn 36, south of Davis Strait, 61°50'N, 56°50'W, 2612 m, 5 specimens, ZMC; --southeast of Portugal, ABYPLAINE stn CP 11, 34°06' N, 17°06'W, 4270 m, 5 specimens, MNHN.

*Distribution.* Only known from the material examined, from both sides of the northern Atlantic, 1900-4300 m.

*Description.* Shell skeneimorph, small, globular, fragile, perfectly transparent, with round aperture and deep umbilicus. Larval shell (Fig. 25D) very distinctly set off from teleoconch, with evenly and finely granular surface, diameter 400 μm. Teleoconch consisting of up to 2.25 strongly convex whorls, smooth apart from indistinct incremental lines and 6 extremely fine spiral lines on body whorl, confined to a very narrow zone and concealed by subsequent whorl. One strong and sharp spiral ridge inside umbilicus (Fig. 25C), steeply descending to lower central corner of aperture, where it ends as a small spine. Outside this ridge, 1-3 weaker lines, inside it only axial sculpture (incremental lines). Aperture tangential, orthocline, evenly rounded with a small indentation of the cross section at the connection to preceding whorl.

*Dimensions.* Height of holotype 1.45 mm.

*Operculum.* (Fig. 28B) very thin, multispiral, with short incremental edge.

*Radula.* (Fig. 27A) 5 - 2 - 1 - 2 - 5. Central tooth of taenioglossate appearance, with a main cusp and about eight smaller, rounded denticles on each side. Frontal surface with two supporting ridges, forming a chink with back of tooth, into which first lateral tooth articulates. Inner lateral tooth of same height as central tooth, flat and rather membranaceous, slightly reinforced centrally, outer basal corner drawn out into a support. Cutting edge with elongate median cusp and about 12 lateral denticles along apical margin. Outer lateral tooth of similar width but 50% taller and considerably stouter. Cutting edge narrowly angulate, long, almost continuous with outer margin, equipped with strong, curved apical cusp and about 16 small denticles along distal half of outer edge. Five marginals united at base, thin, flagellum-like, with inconspicuous basal plates.

*Remarks.* The six microscopic spiral lines which are level with the suture and therefore visible only on the body-whorl, serve as a good distinctive character for *L. major.*

The specimens used as type material, in the SYKES collection, were determined «*Cithna adamsi* JEFFREYS».

*Lissotesta minima* (SEGUENZA, 1876)
(Figs 25E-F, 29A-C)

*Margarites minima* SEGUENZA, 1876:186.
*Trochus minutulus* JEFFREYS, 1883a:95.

*Type material. M. minima*, unknown; *T. minutulus*, see WARÉN 1980.

*Type locality.* M. minima, Monasterace, Sicily, Astian, Upper Pliocene; *T. minutulus*, PORCUPINE Exp. 1870, stns 16, 17, 17a, off Portugal, ca 40°N, 1347-1993 m.

*Material examined.* The types listed and --south of Great Britain, PORCUPINE Exp. 1870, stn 3, 48°31'N, 10°03'W, 1256 m, 3 shells, SYKES collection, BMNH; --Bay of Biscay, BIOGAS stn DS65, 47°36'N, 08°41'W, 2360 m, 1 specimen; --THALASSA stn Z421, 48°23'N, 09°34'W, 950 m, 1 shell; --off Portugal, PORCUPINE Exp. 1870, stn 17, 39°42' N, 09°43'W, 1993 m, 19+17+17 shells, SYKES collection, BMNH; --southern Portugal, off Cape S Vincent, PORCUPINE Exp. 1870, stn 24, 37x19' N, 09°13' W, 531 m, 3 shells, SYKES collection, BMNH.

*Distribution.* From the Bay of Biscay to the Ibero-Moroccan Gulf, ca 500-2300 m depth. Not known from the Mediterranean.

*Remarks.* I admit that I am very uncertain about which name to use for this species. SEGUENZA's description is quite ambiguous as usual, consisting of a comparison with another undescribed species and unaccompanied by a figure. JEFFREYS was, however, unaware of this description but aware that SEGUENZA used the name *Margarita minima* for it. Since there is a description which fits the present species and the identity is confirmed by JEFFREYS' statement, SEGUENZA's name has to be used until something else shows this to be wrong. It is also an undeniable fact that the majority of the species from the Italian Pleistocene deep-sea deposits still exist and thrive in the Atlantic.

It should be remembered that many of the species described during the

18th and early 19th centuries, names which are universally accepted today, were described even more ambiguously.

I have included *L. minima* in *Lissotesta* despite the larval shell not being very similar to the other species, but the umbilicus shows similarities and there is actually no other genus where the shell characters fit better. I have seen no specimens with soft parts.

«*Margarites* cfr. *minutula*» was recorded by CECALUPO & GIUSTI (1986:294, fig. 1.) from off Capraia, Tuscan Archipelago, Italy, 400-440 m. The figure, however, shows that their record probably is based on *Lissomphalia bithynoides* (see p. 178) and certainly not on *Lissotesta minima*.

*Lissotesta gittenbergeri* (van AARTSEN & BOGI, 1988)
(Figs 29D-F, 26A)

*Anekes gittenbergeri* van AARTSEN & BOGI, 1988:28.
*Anekes gittenbergeri*: -BOGI & NOFRONI 1989:144.

*Type material*. Holotype RMNH 55981.
*Type locality*. Central Tyrrhenian Sea, 200 m.

*Material examined*. Southwest of Portugal, Gorringe Bank, SEAMOUNT stn DW05, 36°32.0'N, 11°37.9'W, 180 m, 1 sh, MNHN; --stn DW06, 36°30.2'N, 11°37.9'W, 250 m, 1 sh, SMNH; --stn DW16, 36°33.1'N, 11°32.5'W, 255-265 m, 1 sh, SMNH; --Josephine Bank, SEAMOUNT stn DW61, 36°40.2'N, 14°16.0'W, 200-205 m, 1 shell; --Ampere Bank, stn DE98, 35°03.2'N, 12°55.4'N, 300-325 m, 1 sh, MNHN; --west of Gibraltar, BALGIM stn DR40, 35°50'N, 06°09'W, 362 m, 1 shell, MNHN; --Corsica, off Baie de Calvi, 90-120 m, 10 shells, SMNH; --Off Sicily, 100 m, 1 shell, SMNH.

*Distribution*. Western Mediterranean and the adjacent part of the Atlantic, 100-400 m.

*Remarks*. *Lissotesta gittenbergeri* can be recognised by the strong, very symmetrically arranged spiral cords all over the shell. The species was, together with *L. turrita* placed in *Anekes* by van AARTSEN & BOGI (1988), but species of that genus have a normally coiled protoconch, and a characteristic sculpture of sharp, raised lines.

*Lissotesta turrita* (GAGLINI, 1987)
(Figs. 26B, 30A-F)

*Cyclostrema turritum* MONTEROSATO 1875:23 (nom. nud.).
*?Margarita miliaris* SEGUENZA, 1876:186.
*Cyclostrema turritum* MONTEROSATO 1878:80 (nom. nud.).
*Delphinoidea turrita* MONTEROSATO 1890:144 (nom. nud.).
*Cyclostrema turritum* GAGLINI, 1987:5.
*Anekes nofronii* van AARTSEN & BOGI, 1988:29.
*Anekes turrita*: -BOGI & NOFRONI 1989:142.

*Type materials*. *M. miliaris*, lost; *A. nofronii*, holotype in Museo di Bologna no 007051, not examined; *C. turritum*, six syntypes in ZMR.

*Type localities. M. miliaris*, Astian, upper Pliocene, Sicily, Monasterace; *A. nofronii*, Alboran Sea, 160 m; C. *turritum*, Sicily, Palermo, 90 m.

*Material examined. The types of C. turritum* and --off Korsfjorden, western Norway, 60°08.1'N, 05°00.0'E, 300-330 m, 2 specimens, SMNH; --60°08.0'N, 04°58.3'E, 276-256 m, 4 specimens, SMNH; --60°08.1'N, 04°50.5'E, 315-320 m, 2 shells, SMNH; --60°08.3'N, 04°54.3'E, 250-240 m, 2 specimens, SMNH; --West of the Strait of Gibraltar, BALGIM stn DW43, 35°54'N, 06°14'W, 150 m, 1 specimen, MNHN; Gorringe Bank, SEAMOUNT stn DW16, 36°33.1'N, 11°32.5'W, 255-265 m, 1 sh, MNHN; Galicia Bank, SEAMOUNT DW108, 42°50.9'N, 11°53.1'W, 1110-1125 m, 1 sh, SMNH; -- southern France, off Banyuls, Rech Lacaze, 270-254 m, 1 shell, SMNH; --Corsica, off Baie de Calvi, 90-120 m, ca. 300 shells, SMNH; --western Italy, 3 miles west of Capraia, 100 m, 1 shell, SMNH.

*Distribution*. From western Norway, to the western Mediterranean, in 100-350 m.

*Remarks. Margarita miliaris* was described the line before *Margarita minima* (= *minutulus* JEFFREYS), a proximity that SEGUENZA often used to indicate similarity. SEGUENZA's description was: «Very small, blunt, strongly convex, suture channelled, umbilicus circular and deep». *Margarita minima* was also said to have a more constricted umbilicus. It was never figured.

To consider *miliaris* as a synonym of *turrita* without having seen the type or even a Pliocene specimen is not satisfactory, but of the known species in the Mediterranean, SEGUENZA's description certainly fits *L. turrita* better than any other species.

I leave it for future to give a solution as to which of the two names to use, but this tentative identification will at least draw attention to a possible occurrence in Pliocene deposits.

The specimen figured by van AARTSEN & BOGI (1988) is a young one and adult specimens have about half a whorl more than was indicated by them.

«*Tubiola minuta* (JEFFREYS, 1883)» figured by SCHIRÒ (1971b) is probably based on *L. turrita*.

I do not agree with BOGI and NOFRONI (1989) that the specimen figured by CECALUPO & GIUSTI (1986: fig. 1) is *L. turrita*, but consider that specimen to belong to *Lissomphalus bithynoides* (see p. 179).

## Genus *MOELLERIOPSIS* BUSH, 1897

*Moelleriopsis* BUSH, 1897:137. Type species, by monotypy, *M. abyssicola* BUSH, 1897 (Fig. 40C-D), off northeastern United States, 3200 m.

*Abyssogyra* CLARKE, 1961:352. Type species, by original designation, *A. vemae* CLARKE, 1961 (Fig. 40F-H), abyssal, southern Atlantic (new synonym).

*Diagnosis*. Small, skeneimorph gastropods with depressed spire, smooth except for three to six strong periumbilical keels. Aperture almost round. Protoconch with numerous distinct spiral lines. First teleoconch whorl adapically with deep and channelled suture. Radula (4 to 6) - 2 - 1 - 2 - (4 to 6). Central and lateral teeth thin and membranaceous. Operculum stiff and corneous.

*Remarks.* This generic name has hardly been used since it was introduced by Bush. It was overlooked by Thiele (1929), Wenz (1938-44) and Brookes Knight & al. (1960).

I figure the holotype of the type species which is a badly broken shell (Fig. 40C-D).

I also figure the shell and radula of an undescribed species from the Indian Ocean, which is unquestionably referable to *Moelleriopsis*, to show in more detail the characteristics and the variation of the group (Figs 26C, 27B, 28C, 31A). I have examined several other species from deep water off Europe and B. Marshall (pers. comm.) has recognised numerous similar species from off New Zealand.

*Abyssogyra* Clarke, 1961 was based on *A. vemae*, a species similar to *M. messanensis* though more widely umbilicate (holotype MCZ 224962, Fig. 40F-H).

Characteristics of *Moelleriopsis* are the larval shell with distinct spiral ribs and a varix separating it from the teleoconch, the strongly chanelled early suture, a single strong rib on the early teleoconch, which often soon disappears, and the strong keels inside and surrounding the umbilicus. The operculum is multispiral, corneous with short growth zone and cannot be retracted (or only very shortly) into the aperture. The radula (Fig. 27B) is thin and membranaceous with the formula (4 to 6) - 2 - 1 - 2 - (4 to 6). The central tooth is thin and membranaceous with a triangular base and poorly developed anterior supporting ridges. The apical part is drawn out into a long, tongue-like, deeply serrated flap. The first lateral tooth is membranaceous and triangular, with its inner, tip drawn out to a tongue-like serrated flap. The second lateral tooth is claw-like and 1/3 longer than the marginals, with a rather stout, flattened base, and a large, smooth, distal cusp. The marginal teeth are claw-like, united basally, and equipped with a small basal plate. The outer part of the teeth has a comb-like denticulation along the distal 1/4.

Warén & Bouchet (1989) placed *Moelleriopsis* in the Seguenzoidea because of similarities in the radular structure. I now find it better to keep that taxon as a more homogenous and presumably monophyletic group by placing *Moelleriopsis* in the already polyphyletic Skeneidae.

The genus seems to be restricted to rather deep water, usually below 500 m. Until now only a single Recent species has been known from Europe, «*Cyclostrema*» *normanni* Dautzenberg & Fischer, 1897 from the Azores.

*Moelleriopsis messanensis* (Seguenza, 1876)
(Figs 26D, 31B-D)

*Cyclostrema messanensis* Seguenza 1874:332 nom.nud.
*Cyclostrema messanensis* Seguenza, 1876:188.
*Cyclostrema normanni*: -Di Geronimo & Bellagamba 1986:plate 2, figs 3-5 (not Dautzenberg & Fischer, 1897).

*Type material.* Lost?
*Type locality.* Sicily, Monasterace, Astian, Upper Pliocene.

*Material examined.* Bay of Biscay, Thalassa stn X353, 44°07'N, 04°45'W, 645 m, 1 shell, MNHN; --west of the Strait of Gibraltar, Balgim stn DR40,

35°50'N, 06°09'W, 362 m, 1 shell, MNHN; --off southern France, BIOMEDE stn 01, 42°59'N, 06°00'E, 1050-1200 m, 1 shell, MNHN; --stn 02, 42°40'N, 06°00'E, 2370-2420 m, 3 shells, SMNH; --stn 04, 42°00'N, 06°00'E, 2460-2500 m, 1 shell, SMNH; --between Italy and Corsica, central part of the Tuscan Archipelago, in an amphora, 300-400 m, ca 25 shs, coll. CARROZZA, SMNH.

*Distribution.* From the Bay of Biscay, to and including the western and central Mediterranean, 350-2500 m.

*Remarks.* «*Cyclostrema*» *messanensis* was described as «similar to *[Skenea] serpuloides* but larger, spire more prominent, whorls flattened on the upper surface, suture deep, umbilicus smaller and surrounded by four lines». This is as good a description as one can expect of these species and allows identification under the assumption that SEGUENZA's description was based on any of the known species from the Mediterranean.

There is a small possibility that SEGUENZA based his name on *Lodderena catenoides*, but that species does not have a spire more prominent than *S. serpuloides*, while *Moelleriopsis messanensis* has a projecting spire.

I have not had access to any live taken specimen, but the shape of the shell certainly is very similar to *Moelleriopsis*.

«*Cyclostrema*» *normanni* DAUTZENBERG & FISCHER, 1897 attains only 2/3 of the size of M. *messanensis* and is much flatter with only two spiral ribs in the umbilicus.

## Genus *GRANIGYRA* DALL, 1889

*Granigyra* DALL, 1889:395. Type species, by original designation, *Cyclostrema (Granigyra) limatum* DALL, 1889 (Fig. 31E), off Cuba, 560 m.

*Chunula* THIELE, 1925:28. Type species, by original designation, *Chunula typica* THIELE, 1925, west of Sumatra, 750 m (new synonym).

*Diagnosis.* Small to medium-sized, globular skeneimorph gastropods with conspicuous granular sculpture, round aperture and simple umbilicus. Radula 4-6 - 2 - 1 - 2 - 4-6, with ovately pointed central tooth and claw-shaped outer lateral teeth. Inner lateral teeth very small (or absent?). Propodium without penis (*Granigyra* n.sp.).

*Remarks.* I have examined the holotype of the type species of *Granigyra* (Fig. 31E), which is very similar to the new Mediterranean species described below and differs mainly in having more tightly coiled whorls.

Examination of Atlantic specimens of *G. granulifera* revealed a radula with a large ovate, membranaceous central tooth, one rudimentary and one large lateral tooth and four to six slender marginal teeth.

The genus *Chunula* THIELE, 1925 has a radula similar to that of *Granigyra*. I have examined the holotype of *C. typica* THIELE, 1925, the type species, which turned out to be totally disintegrated. However, THIELE's figure of the shell shows the shell to be very similar to *Granigyra*, and it is described as having «granules placed on the growth lines and elongated in the direction of these». This fits perfectly *Granigyra*, which is the older one of the two names and thus has priority.

The genus *Granigyra* contains additional species in European waters, and I give a summary of the described species:

1. «*Cyclostrema*» *tenerum* JEFFREYS, 1883a:91. Described from off Portugal, 1809 m (PORCUPINE Exp. 1870, stn 16). I figure a topotype from the SYKES collection in BMNH (Figs 32A-B, 33A). This species has unusually weak granulation, hardly visible without SEM examination. JEFFREYS' description is misleading, but his figure is better.

2. *Ganesa pruinosa* JEFFREYS, 1883a:94 (referred to *Granigyra* by B. MARSHALL 1988:969). Described from deep water off Portugal. I figure a topotype from the SYKES collection, BMNH (Fig. 33D). This is the largest European species of *Granigyra*, with a very thin and fragile, finely granulate shell. I also illustrate an adult specimen (Figs 32C-D, 33C, 34A).

BROOKES KNIGHT et al. (1960:I272) erroneously considered *G. pruinosa* to be the type species of *Ganesa* JEFFREYS, 1883. *Ganesa nitidiuscula* JEFFREYS, 1883 was, however, designated type species of *Ganesa* by BUSH (1897) as pointed out by B. MARSHALL (1988:950, 969). I figure (Fig. 33B) the syntype mentioned by B. MARSHALL, but admit that I am not able to classify it. It is so far known only from a partly broken syntype.

*Granigyra granulifera* sp.n.
(Figs 32E-F, 34B, 35A-E)

*Type material*. Holotype in MNHN; 8 paratypes in MNHN and 2 paratypes SMNH 4344.

*Type locality*. BIOMEDE 1976, stn 04, 42°00'N, 06°00'E, 2460-2500 m.

*Material examined*. The types and --Bay of Biscay, THALASSA stn Z426, 48°28'N, 09°39'W, 860 m, 1 shell, MNHN; --stn Z436, 48°40'N, 09°56'W, 1210 m, 1 specimen, MNHN; --stn Z449, 48°41'N, 10°34'W, 730 m, 1 shell; --off southern Portugal, BALGIM stn DW11, 36°44'N, 09°31'W, 1505-1540 m, 1 specimen, SMNH; --north of Madeira, ABYPLAINE stn CP11, 34°06'N, 17°06'W, 4270 m, 2 specimens, MNHN; --off southern France, BIOMEDE 1976, stn 02, 42°40'N, 06°00'E, 2370-2420 m, 8 shells, SMNH; --stn 03, 42°17'N, 06°00'E, 2420-2500 m, 5 shells, MNHN; --stn 05, 41°47'N, 06°00'E, 2500-2520 m, 8 shells, MNHN; --stn 06, 41°47'N, 06°34'E, 2500-2600 m, 14 shells, SMNH; --stn 7, 41°47'N, 07°03'E, 2660-2680 m, 1 shell, MNHN; --stn 12, 42°15' N, 07°38'E, 2700 m, 3 shells, MNHN; --stn 13, 42°25'N, 07°04'E, 2640-2660 m, 1 shell, MNHN; --stn 14, 42°40'N, 06°45'E, 2520-2560 m, 2 shells, MNHN; --stn 15, 42°53'N, 06°10'E, 1500-1600 m, 1 shell, MNHN.

Pleistocene fossil, Southern Italy, San Procopio, coll. Paolo Crovato, 1 shell.

*Distribution*. From the Bay of Biscay to Madeira and the central Mediterranean in about 700 - 4300 m depth.

*Description*. Shell small, skeneimorph, heavily granulate, loosely coiled, and colourless. Larval shell (Fig. 32A-B) consisting of about half a whorl, diameter 320 μm, strongly convex, with a fine, sharp granulation of short, small, branching ridges. Adult teleoconch consisting of about 1.8, very loosely coiled whorls, connected to the preceding whorl only for a very short distance and without change of the curvature of the whorl. Last 1-2/10 whorl disjunct in

adult specimens. Sculpture of small sharp tubercles, those on first part of teleoconch to some extent arranged along axial wrinkles, later randomly and evenly scattered all over the shell. Umbilicus narrow and oblique. Aperture almost perfectly round.

*Dimensions*. Height of holotype, 1.68 mm.

*Radula*. (Fig. 34B) (4-6) - 1? - 1 - 1? - (4-6). Central tooth ovate, pointed, membranaceous with slightly thicker cutting edge, equipped with a central cusp and about 4 small and narrow teeth on its sides. Lateral tooth flattened, claw-like with main cusp and 1-3 small teeth on each side. Marginals claw-like, slender, most lateral ones partly united basally, inner ones with small, elongated basal plates. Apical cusp small, 4-6 lateral barbs of same size on each side along apical 1/6 of tooth.

*Operculum*. Thin and membranaceous with abruptly ending growth zone.

*Remarks*. *Granigyra granulifera* differs from the type species of *Granigyra* by having relatively finer granulation. *Granigyra granulifera* differs from its European congeners in having a relatively less fragile shell, coarser granulation, partly disjunct final whorl in adult specimens, and a deeper suture.

The outer lateral tooth is broad and solid compared to the marginals (Fig. 34B, 3) and the central tooth is very thin and mamebranaceous (Fig. 34B, 1). The inner lateral tooth seems, however, to be absent in this species, although it is present (but small and inconspicuous) in *G. pruinosa*.

## Genus *LISSOMPHALIA* gen.n. Warén

*Type species*. *Cyclostrema bithynoides* Monterosato, 1880, Mediterranean.

*Etymology*. Lissos - smooth, omphalos - umbilicus (Greek).

*Diagnosis*. Very small skeneiform archaeogastropods with strongly convex whorls sculptured with incremental lines only. Suture very deep. Umbilicus deep and wide, only with growth-lines. Protoconch with half a whorl and sculptured with 11 strong spiral ridges. Radula absent.

*Remarks*. *Lissomphalia bithynoides* is presently known only from shells, but a very similar, undescribed species from New Caledonia, of the same shape, sculpture, and number of same type of protoconch ridges, turned out not to have a radula. So did also a species from New Zealand (B. Marshall, pers. comm.). It is therefore presently impossible to classify this species in any known family. Pendromidae which family also lacks a radula, (see Warén 1991) has a very different shell, not suggesting relationship.

*Palazzia* Warén, 1991, which genus also seems to lack a radula, is presently classified in the Archaeogastropoda, but the family position is uncertain. The shell does not suggest relations to *Lissomphalia*.

Although I have left the family position open, the genus can be placed in the Skeneidae, where it will easily be refound.

### *Lissomphalia bithynoides* (Monterosato, 1880)
(Figs 39A-C, 40A-B)

*Trochus* (---?) *bithynoides* Monterosato, 1875:24 (nom. nud.
*Cyclostrema bithynoides* Monterosato, 1878:80 (nom. nud.)

*Cyclostrema bithynoides* Monterosato, 1880:66.
not *Cyclostrema bithynoides* Jeffreys, 1883.
*Cyclostrema bithynoides*: - Monterosato 1890:143.
*Cyclostrema bithynoides*: - Gaglini 1987:7.
*Anekes sabellii* Bogi & Nofroni, 1989:144.

*Type material*. *C. bithynoides*, syntypes, 1 broken, 1 complete shell, in ZMR; *A. sabellii*, holotype in Laboratorio di Malacologia, Bologna (not seen), many paratypes see Bogi & Nofroni 1989.

*Type locality*. *C. bithynoides*, Palermo, Sicily, 190 m; *A. sabellii*, Fossa di Roseto, Adriatic, 150 m.

*Material examined*. The types and --southwest of Portugal, Gorringe Bank, 36°33.7'N, 11°30.1'W, 305-320 m, 1 shell, MNHN; --southwest of Portugal, Josephine Bank, 36°40.2'N, 14°16.0'W, 200-205 m, 1 shell, SMNH; --Corsica, Baie de Calvi, 90-120 m, silt with posidonia fibres, 13 shells, SMNH; --southern France, off Banyuls, Rech Lacaze, 270-254 m, 4 shells, MNHN.

*Distribution*. From off southwestern Portugal to the Adriatic in 90-440 m.

*Remarks*. «*Cyclostrema bithynoides* Jeffreys MS», was recorded from Palermo, 190 m by Monterosato (1875, 1878, 1880). In the latter reference it was briefly characterised thus: «Similar to Jeffreys' *trochoides* from Norway and the coast of Portugal, but more globular and with more narrow umbilicus». The identity of *Lissomphalia bithynoides* (Monterosato) was demonstrated by Gaglini (1987), and the name has to be used. On account of this, Monterosato should be quoted as author since he used the name in another sense than Jeffreys (1883a), whose species belongs to *Anekes* and has a finely and irregularly striated sculpture (Holotype Fig. 18C-D). That species is here renamed *Anekes inflata*, see p. 165.

Schiró (1971b) figured «*C. bithynoides*» from Palermo, 190 m (probably one of Monterosato specimens).

Bogi & Nofroni's SEM photos show beyond any doubts that *Anekes sabellii* is based on the same species as that Monterosato's brief description was founded upon. They also agreed that *A. sabellii* was among the specimens in ZMR identified as *bithynoides* by Monterosato, but questioned the identity with the «real *Cyclostrema bithynoides*», evidently referring to the species later described by Jeffreys.

«*Margarites minutula* (Jeffreys, 1883)» was recorded by Cecalupo & Giusti 1986:24, fig. 1, and seems to be based on *L. bithynoides*. It originates from southwest of Capraia, 400-440 m depth.

«*Rissoella globularis* Jeffreys, 1852» was reported from the Central Adriatic, 150 m and from the Gulf of Naples, 150 m by Bogi & Nofroni (1986:154). Both these records seem to be based on *Lissomphalia bithynoides* (Bogi & Nofroni 1989).

(*Rissoella globularis* is a northern species, of which I have seen no specimens taken south of Great Britain. It was well figured by Fretter & Graham (1978:fig. 184). Fasulo (1989:20) concluded that the only additional Mediterranean record of *R. globularis* (Palazzi 1983:98) was not to be relied on, an opinion I share.)

## Family TROCHACLIDIDAE

*Trochaclis* was originally classified in the Mesogastropoda, but WARÉN (1989) transferred it to the Archaeogastropoda and suggested affinity to Acremodontinae B. MARSHALL (1983). B. MARSHALL has since admitted synonymy (in litt.). HICKMAN & MCLEAN (1990) considered the Trochaclididae (= Acremodontinae) a subfamily of Trochidae, because of structures in the operculum, epipodium and ctenidium.

Characteristic for *Trochaclis* is the «down-like» dentation of the radula, which is described in more detail under *Trochaclis*. It is a good apomorphy but gives no information about relations. Several additional genera are being described by B. MARSHALL (in prep.).

### Genus *TROCHACLIS* THIELE, 1912

*Trochaclis* THIELE, 1912:192. Type species, by monotypy, *T. antarctica* THIELE, 1912, (Figs 26F, 36E, 37, 38, 28D), Antarctic.

*Diagnosis*. Small, tall-spired skeneimorph gastropods with smooth shell except two to four, strong, steeply ascending spiral ridges in umbilicus. Protoconch spirally ridged. Radula with at least 40 undifferentiated, down-like teeth per transverse row.

*Remarks*. After the treatment of *Trochaclis* by WARÉN (1989), further material of the type species, *T. antarctica* was found in USNM. This has allowed a better description of the radula (Figs 37-38) which consists of at least 40 teeth per transverse row. There is no central tooth. The most central teeth have a broadly ovate basal plate with the inner, distal part drawn out to a feather-like process. Going outwards along the strongly ellipsoid transverse row, there appears a second little process on the basal part, which on still more lateral teeth form a second «feather». Further outwards there are up to five such «feathers» on each tooth. The outermost teeth are incompletely separated basally, equipped with a flat, narrow, basal plate, a single «feather» and on the inner side beside the base of the «feather», a small cusp. There is no abrupt change between these different tooth morphologies.

The feather-like process consists of a distal, hand-like part with 15-20 «fingers», a flat, membranaceous shaft with the outer side equipped with a series of barbs, like a feather (Fig. 38A).

The continuous transition along the row, gives an impression that the row is derived either from a single field of teeth, either laterals or marginals, or from a row where the teeth have not differentiated into different fields of laterals or marginals.

I also figure the shell of the type species of *Trochaclis*.

*Trochaclis antarctica* was recently (HAIN 1989, 1990, pers. comm.) reported to be common on and in large hexactinellid sponges, as was *T. islandica* WAŔEN, 1989. According to S. HAIN (pers. comm.) the stomach contents indicates spongivory.

*Trochaclis versiliensis* sp. n. WARÉN, CARROZZA & ROCCHINI.
(Figs 26E, 36A-D)

*Type material*. Holotype, SMNH 4345. Paratypes in colls CARROZZA and ROCCHINI

*Type locality*. Central part of the Tuscan Archipelago, ca 42.5°N, 10°E, in an amphora from 300-400 m depth.

*Material examined*. The type material and --off northwestern Spain, Galicia Bank, SEAMOUNT I, stn DW116 42°52.4'N, 11°50.6'W, 985-1000 m, 1 shell, SMNH; --off southwestern Portugal, Gorringe Bank, SEAMOUNT I, stn CP20, 36°33.7'N, 11°30.1'W, 305-320 m, 2 specimens, SMNH; Ampere Bank, SEAMOUNT I, stn CP99, 35°03.8'N, 12°55.4'N, 225-280 m, 1 specimen, MNHN.

*Distribution*. The western Mediterranean and the adjacent Atlantic in 200-1000 m.

*Description*. Shell small, globular, fairly solid, transparent, skeneimorph. Larval shell (Fig. 26E) consisting of about 0.5 whorl, diameter 250 $\mu$m and sculptured by small, sharp, branching tubercles, arranged in a spiral pattern which becomes more loosely arranged towards teleoconch. Adult teleoconch of about 2, almost smooth whorls, with some indistinct incremental lines. Adapical part of first whorl distinctly flattened and bearing a single spiral rib, which becomes indistinct and disappears on second whorl. Whorls rather tightly coiled, suture shallow. Aperture large, distinctly broader in lower part, prosocline and tangential. Umbilicus narrow, deep and open, sculptured by one slowly descending, outer spiral ridge and a more steeply descending and central rib, which eventually joins the inner lip.
*Dimensions*. Height of holotype 1.18 mm, maximum height 1.7 mm.

*Remarks*. Despite that no soft parts have been examined of this species, the position in the genus *Trochaclis* is quite convincing because of the great similarity to the two species for which radulae are known. Characteristic features of the shell are the spiral rib on the first teleoconch whorl, the shape of the tangential and prosocline aperture, and the sharp, descending ribs in the umbilicus.

*Trochaclis versiliensis* differs from *T. islandica* in having a more depressed spire, a more distinct spiral rib on the initial teleoconch whorl, and in having only two ribs in the umbilicus, where *T. islandica* has three ribs.

## Subclass HETEROBRANCHIA

### Family XYLODISCULIDAE n.fam.

*Diagnosis*. Small gastropods with a smooth, *Planorbis*-like shell, and hyperstrophic protoconch (in species with planktotrophic development). Animal with anteriorly shallowly bifid foot, long, slender tentacles with eyes in the base, short, cylindrical snout and two pallial tentacles, of which the anterior one is much longer. Radula 2 - 1 - 0 - 1 - 2. Lateral teeth roughly fan-shaped with a narrow base, broad, serrated cutting edge and outer, smooth side fol-

ded forwards. Inner marginal tooth broader, paddle shaped with inner side and broad, rounded top finely serrated. Outer marginal claw-shaped with inner side serrated for a short distance close to point. Jaws absent?

*Remarks*. Presently there is only a single genus in this family, *Xylodiscula*, but it is likely that also some other of the small flat-spired gastropod genera will prove to belong here.

MARSHALL (1988) classified *Xylodiscula* in the Orbitestellidae, but that family has since been described in detail and redefined by PONDER (1990b). Species of *Xylodiscula* differ from that family in having the foot deeply divided anteriorly and the radula has lost the taenioglossate configuration typical for the orbitestellids. Furthermore, orbitestellids have a pair of conspicuous and complex jaws, evidently lacking in *Xylodiscula*.

## Genus *XYLODISCULA* MARSHALL, 1988

*Xylodiscula* MARSHALL, 1988:988. Type species, by original designation, *X. vitrea* MARSHALL, 1988, off eastern Australia, upper bathyal, on sunken wood.

*Diagnosis*. As for the family.

*Remarks*. The two new species described here resemble the species described by MARSHALL so closely that they were originally held to be conspecific. *Xylodiscula boucheti* resembles *X. eximia* MARSHALL, but the species from New Zealand has a more narrow umbilicus and half a whorl more in the larval shell.

*Xylodiscula lens* resembles *X. vitrea* MARSHALL, but has a still wider umbilicus corresponding to 40-45% of the diameter of the shell.

MARSHALL described his new species from pieces of sunken drift-wood, from off New Zealand and the Australian east coast, and it is probably not a coincidence that the two new species described here were found living in a biotope characterized by *Posidonia* fibres and on sunken drift-wood

### *Xylodiscula boucheti* sp.n. WARÉN, CARROZZA & ROCCHINI
(Figs 41A-D, 42A-B, 43, 44, 45A-B)

*Type material*. Holotype SMNH 4343, two paratypes in MNHN.
Type locality. Corsica, outer part of Baie de Calvi, 90-120 m, on a bottom largely consisting of old *Posidonia* fibres,

*Material examined*. The types and --central part of the Tuscan Archipelago, in an amphora from 300-400 m depth, 20 shs; --off Capraia, Tuscan Archipelago, 200 m, 1 shell, MNHN.

*Description*. Shell small, transparent, fragile, *Planorbis*-like. Larval shell (Fig. 45A-B) of 1.3 distinctly hyperstrophic whorls, initial part weakly sculptured with irregular, sharp, very short, randomly dispersed ridges. Teleoconch of 2.3 whorls, sculptured only with weak incremental lines. Whorls just barely touching; suture consequently deep and channeled. Cross-section of whorls rounded, adapical side slightly flattened and sloping outwards from centre. Whorls coiled with upper surface at approximately same level and wi-

th an overlap over preceding whorl, measured on underside, corresponding to 1/5 - 1/6 of width of earlier whorl. Width of umbilicus about 40% of total diameter.

*Dimensions*. Diameter of holotype 1.72 mm.

*Radula*. (Fig. 43.) As described above for the family.

*Soft parts*. (Fig. 44.) Foot very short and broad, posteriorly blunt, anteriorly shallowly bifid, with anterior corners drawn out to a width 60 % wider than foot, depth of indentation about 1/4 of width when crawling. Tentacles long and slender with very small eyes situated in centre of the bases. Snout short and conical. Two pallial tentacles situated close together at right corner of pallial cavity, anterior one three times longer than posterior one. Two white, pigmented mantle organs situated centrally in pallial skirt, anterior one larger. Periostracum thin, slightly lamellose, brownish.

*Remarks*. The two new species of *Xylodiscula* are quite difficult to distinguish, but *Xylodiscula boucheti* has a smaller umbilicus, diameter about 30-33% of the diameter of the shell, while that of *X. lens* corresponds to 40%. This difference is easily seen in a basal view when the two species are placed beside each other. The difference is, however, less obvious in young specimens.

*Xylodiscula lens* sp.n. WARÉN
(Figs 41E-F, 42C-D, 45C-D)

*Type material*. Holotype SMNH 4346 and 1 paratype, SMNH 4347, 4 paratypes in MNHN.

*Type locality*. Corsica, outer part of Baie de Calvi, 90-120 m, on a bottom largely consisting of old *Posidonia* fibres, 6 specimens and shells.

*Material examined*. The types and --Tuscan Sea, 400 m depth, on sunken drift wood, 3 specimens, coll. CARROZZA.

*Description*. Shell small, transparent, fragile, *Planorbis*-like. Larval shell (Fig. 45C-D) of 1.25 distinctly hyperstrophic whorls, initial part weakly sculptured with irregular, sharp, very short, randomly dispersed ridges. Adult teleoconch of 2.3 whorls, sculptured only by weak incremental lines. Whorls connected only for a very short distance, more or less at the periphery of the preceding one. Suture consequently deep and channeled. Cross-section of whorls rounded triangular, adapical side slightly flattened and sloping outwards from centre, abapical side also flattened, periphery of whorls well below mid-height. Whorls coiled with upper surface at approximately same level or with earlier whorl lower. Last whorl overlaps preceding whorl, measured on underside, corresponding to 1/8 - 1/10 of width of earlier whorl. Periostracum thin, slightly lamellose, brownish.

*Dimensions*. Diameter of holotype 1.74 mm.

Radula. Not examined.

Soft parts. Similar to *boucheti*

*Remarks*. See *Xylodiscula boucheti*.

## COMMENTS ON VARIOUS SKENEIMORPH TAXA

*Skenea macrostoma* SEGUENZA, 1876: 180 was described from Astian deposits (Upper Pliocene) at Messina. «Smooth, spire flattened, whorls convex, last one very large, and high, rounded, with deep suture, umbilicus funnel-shaped, boredered by an angle at the edge.» I have not been able to associate this name with any Mediterranean species known to me.

*Margarita helicinoides* SEGUENZA, 1876:186 was described from the upper Pliocene of Altavilla, Palermo, Sicily. «Similar to [*Margarites*] *helicina* but smaller, whorls more convex, umbilicus much more narrow.» I am not aware of any Mediterranean species for which this name could be used.

*Cyclostrema monterosatoi* ANCEY, 1898: 54. Port Gueydon, Kabylia (Algeria). This species was described as being very similar to *Cyclostrema dautzenbergianum* (= *Skeneoides exilissima*), but lacking the riblets. The spiral striation was said to be very fine and there are two spiral keels below the middle of the last whorl,the lower of which surrounds the umbilicus. The spiral striation is strong in the umbilicus. This description could possibly be based on *Lodderena catenoides*, but being aware of the high number of strange and little known species along the northern coast of Africa, I prefer to leave the name as a *nomen dubium*, particularly since ANCEY's name does not threaten any other name.

*Cyclostrema depressum* (MONTEROSATO, 1878:80 nom. nud., Palermo 250-300 m); MONTEROSATO, 1880:67. Type locality. Sicily, Palermo, 250-300 m. *C. depressum* was described as «similar to *nitens*, but more depressed, more oblique aperture and open umbilicus» (MONTEROSATO 1880). GAGLINI (1987) figured and briefly described this species. The size is said to be 0.8 x 0.5 mm.

Two shells from «Palermo, 1875» (ZMR) were examined,. They belong to a rather flat species with an aperture and umbilicus similar to *Dikoleps nitens*, but the shell has five spiral keels in the umbilicus.

*Trochus laevissimus* SEGUENZA, 1880(:270) was described from Astian deposits (upper Pliocene) and has a shape very similar to *Granigyra*, but the shell is very smooth and polished, with no trace of sculpture. It may be related to *Akritogyra conspicua*. I have seen no types or other specimens.

«*Cithna naticiformis* JEFFREYS, 1883» GUBBIOLI & NOFRONI 1986:6. JEFFREYS described his species from PORCUPINE Expedition stn 17a. I have seen no specimens of that species from the Mediterranean. GUBBIOLI & NOFRONI used the name for a species they found in egg capsules of skates, and that species will be discussed by McLean (in press).

«*Anekes*» *giustii* NOFRONI & BOGI 1989:147. Holotype in Laboratorio di Malacologia, Universita di Bologna. Many syntypes listed by BOGI & NOFRONI (1989). The type locality is near Isola di Capraia, Italy, 300-400 m. I have examined two shells which seem to belong to this species, from the Gorringe Bank, SEAMOUNT stn DE10, 36°27.4'N, 11°35.0'W, 500-545 m, and from off northwestern Iceland, 65°06' N, 26°42' W, 241 m, 5 Sept 1983 (kindly sent for examination by Mr JON BOGSON, Reykjavik, Fig. 39D). The systematic position remains uncertain.

*Tholapex solutum* Di Geronimo, 1974. Nofroni (1984) considered this name to be based on a very young heteropod, *Firoloida desmaresti* Le Seur, 1817. This seems to be correct. *Tholapex* Di Geronimo, 1974 will therefore enter the synonymy of *Firoloida*. To the synonyms can also be added *Cyclostrema minutum* Jeffreys, 1883b (new synonym). Nordsieck's (1983) record of «*Skenea minuta* (Jeffreys, 1883)» from Ibiza is based on a very young land-snail (material in SMF examined).

*Moelleria costulata* (Müller, 1842). Bogi & Nofroni (1986:155) recorded a small (0.5-0.6 mm) costellate and broadly umbilicate species under this name from Bocce di Bonifacio, 100-900 m and Cabo Carbonara, 700 m.

I have not seen the species figured by Bogi & Nofroni, and their figure is not good enough to allow any conclusions about its identity, except that it is not *M. costulata*, of which I give a figure for comparison (Fig. 39E-F). This an Arctic shallow-water species. Bogi & Nofroni's figure bears some resemblance to the larval shell of *Laeviphitus verduini* VanArtsen, Bogi & Giusti, 1989, but that larval shell is smaller, about 0.35 mm.

*Skenea forbesi ibizenca* Nordsieck, 1982, was described from the Baleares, Ibiza, 50 m depth. The holotype (in SMF) is a very young land-snail, the paratype is *Skenea serpuloides*.

*Skenea vatovai* Nordsieck, 1974, from the Ionian Sea, is based on a young heteropod (holotype and two paratypes in SMF).

*Skenea trochoides minutissima* Nordsieck, 1982, described from the Baleares, Ibiza, is based on a young *Obtusella intersecta* (S.V. Wood, 1857) (Rissoidae) and 2 specimens of *Rissoella* sp. (Rissoellidae) (3 syntypes in SMF).

## SPECIES ERRONEOUSLY RECORDED FROM THE MEDITERRANEAN

The following species have been recorded from the Mediterranean, but all specimens which I have examined have been erroneously identified and it can not be verified that they occur there.

*Skenea rugulosa* (G.O. Sars, 1878). «Messina fide Granata», Jeffreys (1883a:90). A northern species, only known from Iceland and Scandinavia (Warén 1991). In the Monterosato collection there are three shells labelled with this name and sent to Monterosato by Granata. They do not belong to G.O. Sars' species, but their identity is uncertain. At a size of 1.0 mm they have 2.1 teleoconch whorls, which is more than what an adult *rugulosa* of 1.5 mm has in Norway.

*Skenea trochoides* (Friele, 1874). Recorded from the Mediterranean by Jeffreys (1883a:91, «Palermo fide Monterosato»). A northern species. An old shell, possibly a reworked fossil is known from the northern part of the Bay of Biscay (Warén 1991). The species is known otherwise only from the Faroes, Scandinavia and northwards (Warén 1991).

*Skenea laevigata* (Friele, 1874) is a synonym of *S. trochoides* (Warén 1991). Grecchi (1984:21) reported *S. laevigata* from Quarternary submarine

deposits in the Mediterranean, but his figure shows a young heteropod (Warén 1991).

*Skenea basistriata* (Jeffreys, 1877). Nordsieck's record (1982) from Ireland seems to be based on the young of a species of *Gibbula*, but the material could not be found in SMF. Jeffreys' species should not be confused with *Cyclostrema* (*Moelleria*) *basistriatum*, figured and described as a new Pleistocene (Siciliano) fossil from Ficarazzi, near Palermo, Sicily by Brugnone (1876:17). There is no type material left in ZMR. The name was later (Brugnone 1877) changed to *C. curvistriatum*, to avoid homonymy with Jeffreys species with the same name. This change has been accepted by all later authors. The size given by Brugnone (2 x 2 1/4 mm) and the description clearly indicate that the name was based on a species similar to *Skenea basistriata*, and it is possible that it was based on a form, of which I have seen specimens from deep water in the Bay of Biscay and off Portugal (Fig. 47B-D). These specimens are very similar to *S. basistriata* from northern Europe, but the sculpture is more restricted to the umbilicus and the adjacent part of the basis. Furthermore, the inner lateral teeth of the radula have larger and fewer denticles (Fig. 46A-B). I do not want to take a decision presently whether to regard it as a distinct species or not.

The generic name *Lissospira* Bush, 1897 is based on *Ganesa proxima* Tyron, 1888, from off the northeastern United States, deep water. The radula of the type species is not known, but from similarity in shell characters it can be assumed to be closely related to *basistriata*. The shell has a spiral sculpture of broad to narrow cords, which may cover all the shell or only the basal parts. It may be better, however, to withhold the splitting of *Skenea* and keep *Lissospira* as a subgenus. The correct name of the southwest European form will then be *Skenea* (*Lissospira*) aff. *basistriata*.

## ACKNOWLEDGEMENTS

I want to thank P. Bouchet, B.A. Marshall, W.F. Ponder, who contributed material to this paper. S. Gofas is gratefully acknowledged for the drawings of *Xylodiscula boucheti*, which were prepared from sketches by P. Bouchet. P. Bouchet and S. Gofas also participated in the field work when some of the material was collected. C. Hammar prepared of the prints of the SEM photos of which many were contributed by P. Bouchet. The staff at the museums from which type material was borrowed is gratefully thanked, especially K. Way, BMNH, and S. Greenhouse, USNM. Dr. A. Gaglini, Rome, is thanked for making possible access to the Monterosato collection, ZMR. I also thank F. Ghisotti and P. Cesari for making available a copy of Danilo (1856). P. Bouchet, F. Carrozza, S. Gofas, B. Marshall, and J.H. McLean read, commented and gave valuable advice on an early draft of this paper.

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## APPENDIX
## SUMMARY OF TAXONOMICAL CHANGES
(Not listed in abstract; concerned names in bold.)

The following taxonomical changes are suggested:

***Abyssogyra*** CLARKE, 1961 is considered a junior synonym of *Moelleriopsis* BUSH, 1897.

*Cyclostrema* ***affine*** JEFFREYS, 1883 is transferred to *Anekes* and a neotype is selected.

*Cyclostrema* ***ammonoceras*** A. ADAMS, 1863 is figured.

***Brookula*** IREDALE, 1915 is transferred to Eucyclinae (Trochidae).

*Cyclostrema* ***catenoides*** MONTEROSATO, 1877 is transferred to *Lodderena* IREDALE, 1924.

***Chunula*** THIELE, 1925 is considered a junior synonym of *Granigyra* DALL, 1889.

*Cyclostrema* ***conspicuum*** MONTEROSATO, 1880 is transferred to *Akritogyra*.

*Delphinula* ***elegantula*** PHILIPPI, 1844 is tentatively classified in *Parviturbo*.

*Cyclostrema* ***fenestratum*** CHASTER, 1896 is tentatively classified in *Parviturbo*.

*Skenea* ***forbesi*** NORDSIECK, 1982 is synonymised with *Dikoleps pusilla* (JEFFREYS, 1847).

*Cyclostrema* ***funnazzensis*** DE GREGORIO, 1889 is considered a synonym of *Cirsonella romettensis* (GRANATA, 1877).

***Ganesa*** JEFFREYS, 1883 and its type species ***nitidiuscula*** JEFFREYS, 1883 are discussed and considered of uncertain systematic position.

*Anekes* ***gittenbergeri*** VAN AARTSEN & BOGI, 1988 is classified in *Lissotesta*.

***Granigyra*** DALL, 1889 is provisionally classified in Skeneidae.

*Omalogyra* ***granulosa*** SYKES, 1925 is transferred to *Retigyra* WARÉN, 1989 and a neotype is selected.

*Skenea forbesi* ***ibizenca*** NORDSIECK, 1982 is based on a young land-snail.

*Cyclostrema* ***iheringi*** DAUTZENBERG & FISCHER, 1897 is transferred to *Retigyra*.

***Intortia*** EGOROVA, 1972 is synonymised with ***Lissotesta***.

*Lissotesta* IREDALE, 1915 is provisionally placed in Skeneidae. The Antarctic species *Submargarita strebeli* THIELE, 1912, *Submargarita similis* THIELE, 1912, *Submargarita impervia* STREBEL, 1909, *Margarita notilis* STREBEL, 1909, *Submargarita mamillata* THIELE, 1912, *Submargarita unifilosa* THIELE, 1912, *Cyclostrema humile* PELSENEER, 1903, *Cyclostrema liratulum* PELSENEER, 1903 are transferred to *Lissotesta*.

*Cyclostrema* ***messanensis*** SEGUENZA, 1876 is transferred to *Moelleriopsis* and recorded from Recent specimens.

*Margarites* ***minima*** SEGUENZA, 1876 is considered the valid name for *Trochus minutulus* JEFFREYS, 1883 and tentatively placed in *Lissotesta*.

*Skenea trochoides* ***minutissima*** NORDSIECK, 1982 is based on *Obtusella intersecta* (S.V. WOOD, 1857) (Rissoidae) and on *Rissoella* sp. (Rissoellidae).

*Trochus* ***minutulus*** JEFFREYS, 1883 is considered a junior synonym of *Lissotesta minima* (SEGUENZA, 1876)

*Cyclostrema* ***minutum*** (JEFFREYS, 1883) is a junior synonym of *Firoloida desmaresti* LESEUR, 1817.

***Moelleriopsis*** BUSH, 1897 is provisionally placed in Skeneidae.

***Munditiella*** Kuroda & Habe, 1954. The type species, *Cyclostrema ammonoceras* A. ADAMS, 1863 is figured.

*Cyclostrema* ***normanni*** DAUTZENBERG & FISCHER, 1897 is transferred to *Moelleriopsis*.
***Parviturboides*** PILSBRY & MCGINTY, 1950, is confirmed to belong to the Vitrinellidae and its radula is figured.
*Ganesa* ***pruinosa*** JEFFREYS, 1883 is transferred to *Granigyra*.
***Retigyra*** WARÉN, 1989 is provisionally placed in Skeneidae.
*Anekes* ***sabellii*** BOGI & NOFRONI, 1989 is considered a junior synonym of *Lissomphalia bithynoides* (MONTEROSATO, 1880).
*Cyclostrema* ***simile*** JEFFREYS, 1883 is transferred to *Akritogyra*.
«*Cyclostrema* ***sphaeroidea***» sensu JEFFREYS 1883 is tentatively classified in *Parviturbo*.
*Cyclostrema* ***tenerum*** JEFFREYS, 1883 is transferred to *Granigyra*.
***Tharsiella*** BUSH, 1897 is synonymised with *Cirsonella* ANGAS, 1877.
*Tubiola nivea* (GMELIN, 1791) (Indo-Pacific), type species of ***Tubiola*** A. ADAMS, 1863 is referred to Vanikoridae.
*Cyclostrema* ***turrita*** GAGLINI, 1987 is considered the valid name for *Anekes nofronii* VAN AARTSEN & BOGI, 1988 and classified in *Lissotesta*.
*Cyclostrema* ***valvatoides*** JEFFREYS, 1883 is figured.

Mediterranean records of the following species are based on erroneous determinations and the species are excluded from the Recent Mediterranean faunal list:

*Anekes unduliscultpta* BOUCHET & WAŔEN, 1979
*Cyclostrema affine* JEFFREYS, 1883
*Cyclostrema basistriata* JEFFREYS, 1877
*Cyclostrema bithynoides* JEFFREYS, 1883
*Cyclostrema laevigata* FRIELE, 1874
*Cyclostrema normanni* DAUTZENBERG & FISCHER, 1897
*Cyclostrema rugulosa* G.O. SARS, 1878
*Cyclostrema similis* JEFFREYS, 1883
*Cyclostrema sphaeroidea* sensu JEFFREYS 1883.
*Cyclostrema trochoides* FRIELE, 1874
*Cyclostrema valvatoides* JEFFREYS, 1883
*Margarites minima* SEGUENZA, 1876 (= *Trochus minutulus* JEFFREYS, 1883)
*Moelleria costulata* (MÖLLER, 1842)
*Rissoella globularis* (JEFFREYS, 1852)

NOTES

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It is very likely that the genus *Pareuchelus* BOETTGER, 1906 (Verhandlungen und Mitteilungen der siebenbürgischen Verein für Naturwissenschaft in Herrmannstadt **55**: 101-217) is a better placement for the species I have classified in *Parviturbo*, but a decision will have to await examination of actual specimens of the type species *P. excellens* BOETTGER, 1906.

To page 160
S. GOFAS has recently examined living specimens of *Pseudorbis granulum* and could confirm it position in Skeneidae s.str. since the species has a well developed propodial penis.

Only when correcting the second set of proofs did I get to know about a paper by F.

Rubio-Salazar (dated 1990 but published 17 October 1991. Skeneidos infra y circalitorales de las costas del sur y levante Español. *Iberus* **9**: 187-202).

Crawling animals were there figured by S. Gofas, who when preparing those drawings, was not aware of the propodial penis, and it has not been included in the drawings.

Rubio-Salazar's records of *Skenea (Lissospira) basistriata* from the Alboran Sea are, judging from his figure 23, based on young *Cirsonella romettensis*. The record of *«Lissospira» affine* from the Alboran Sea seems to be based on *Akritogyra curvilineata*, which is the first Mediterranean record of this species.

The use of generic names by Rubio-Salazar does not change my opinion or necessitate further comments.

**Legends to figures.**

Fig. 1. -A. *Parviturbo acuticostatus*, Catalina Island, California, USNM 47055, ex coll. Stearns, diameter 3.0 mm. -B. P. *fenestratus*, Punta Almina, Ceuta, 30-43 m, diameter 1.0 mm. -C. *Parviturboides interruptus*, Galeta Island, Panama, seagrass bed, USNM 732934, diameter 1.25 mm. -D. *Parviturbo elegantula*, Cannitello, Plio-Pleistocene of southern Italy, coll. Monterosato, SMNH, diameter 1.7 mm.

Fig. 2. Radulae. -A. *Parviturbo acuticostatus*, Catalina Island, California, USNM 47055, ex coll. Stearns. -B. *Parviturboides interruptus*, Galeta Island, Panama, seagrass bed, USNM 732934. -C. *Lodderena catenoides*, Acitrezza, Sicily, 36 m. Scale lines in μm.

Fig. 3. Protoconchs. -A. *Parviturbo acuticostatus*, USNM 47055, ex coll. Stearns, Catalina Island, California, diameter 250 μm. -B. *P. fenestratus*, Punta Almina, Ceuta, Spain, 30-43 m, diameter 240 μm. -C. *Parviturboides interruptus*, Galeta Island, Panama, seagrass bed, USNM 732934, diameter 425 μm. -D. *Parviturbo elegantula*, Cannitello, Plio-Pleistocene, southern Italy, coll. Monterosato, SMNH, diameter 350μm. -E. *Munditiella ammonoceras*, Syntype, NMV F 31501, protoconch diameter 205 μm. -F. *Lodderena catenoides*, Acitrezza, Sicily, 36 m, diameter 225 μm.

Fig. 4. Opercula. -A. *Parviturbo acuticostatus*, Catalina Island, California, USNM 47055, ex coll. Stearns, diameter 1.16 mm. -B. *Skenea serpuloides*, Ceuta, Spain, inside, diameter 0.66 mm. -C. *Cirsonella romettensis*, northern Bay of Biscay, Thalassa stn Z447, 48°47'N, 11°13'W, 1430-1550 m, diameter 1.25 mm. -D-E. *Cirsonella extrema*, Antarctica, Davis Sea, 66°33'S, 93°01'E, 80 m, USNM 613041, out- and inside, diameter 1.7 mm. -F. *Akritogyra curvilineata*, holotype, diameter 0.96 mm.

Fig. 5. Radulae. -A. *Skenea serpuloides*, Ceuta, Spain. -B. *Skeneoides exilissima*, Baie De Baleeira, Algarve, Portugal, intertidal. -C. *Lodderena minima*, southern side of Jarvis Bay, New South Wales, 35°05.7'S, 150°50.2'E, LACM 79-43. Scale lines in μm.

Fig. 6. Radulae. -A. *Skenea serpuloides*, Ceuta, Spain, lateral, oblique view to show lateromarginal plates. -B. *Lodderena catenoides*, Acitrezza, Sicily, oblique anterior view of central field and lateromarginal plates. Scale lines in μm.

Fig. 7. -A-B. *Dikoleps pruinosa*, southern Alboran Sea, 35°25.7'N, 04°18.8'W, 170 m, BALGIM stn DW 132, top view 0.87 mm, front view 0.81 mm. -C. *Lodderena minima*, southern side of Jarvis Bay, New South Wales, 35°05.7'S, 150°50.2'E, LACM 79-43A, basal view diameter 1.1 mm. -D-F. *L. catenoides*, Acitrezza, Sicily, 36 m, front view 1.1 mm, top view 1.2 mm, basal view 1.1 mm.

Fig. 8. -A-C. 5. *Munditiella ammonoceras*, syntype, NMV F 31501, front view, diameter 2.2 mm, top view, diameter 2.1 mm, basal view, diameter 2.2 mm. -D-H. *Skeneoides exilissima*. -D. Syntype of *Cyclostrema subalveolatum*, MNHN, diameter 0.90 mm. -E. Anse Sarchal, Ceuta, Spain, mediolittoral, diameter 0.93 mm. -F. Baie de Baleeira, Algarve, Portugal, intertidal, front view, diameter 1.0 mm. -G-H. Acitrezza, Sicily, 36 m, top view, diameter 1.1 mm; front view 1.1 mm.

Fig. 9. Protoconchs. -A. *Lodderena minima*, southern side of Jarvis Bay, New South Wales, 35°05.7'S, 150°50.2'E, LACM 79-43A, diameter 265 μm. -B. *Skeneoides exilissima*, syntype of *Cyclostrema subalveolatum*, MNHN, diameter 255 μm. -C. *Skeneoides jeffreysii*, ex MONTEROSATO, SMNH, diameter 275 μm. -D. *Dikoleps pruinosa*, Ceuta, Spain, diameter 210 μm. -E. *Cirsonella romettensis*, Gorringe Bank, SEAMOUNT stn CP20, 36°33.7'N, 11°30.1'W, 305-320 m, diameter 260 μm. -F. *Cirsonella extrema*, Antarctica, Davis Sea, 66°33'S, 93°01'E, 80 m, USNM 613041, diameter 520 μm.

Fig. 10. *Skeneoides jeffreysii*. -A, C, D. From MONTEROSATO, SMNH, front view 1.0 mm; top view 0.89 mm, basal view, 0.97 mm. -B. Adventure Bank, 167 m, coll. SYKES, BMNH, diameter 0.93 mm.

Fig. 11. -A. *Cirsonella australis*, syntype, BMNH 1877.12.5.88, diameter 2.5 mm. -B. *C. extrema*, Antarctica, 66°33'S, 93°01'E, 80 m, USNM 613041, diameter 3.1 mm. -D. *C. romettensis*. Bay of Biscay, THALASSA stn Z447, 48°47'N, 11°13'W, 1430-1550 m, diameter 2.64 mm. -C. Bay of Biscay, THALASSA stn X353, 44°07'N, 04°45'W, 645 m, diameter 1.21 mm. -E. Syntype of *Cithna adamsi*, PORCUPINE Exp. 1870, stn 16, USNM 186380, 2.1 mm.

Fig. 12. Radulae of *Cirsonella*. -A. *C. romettensis*, Bay of Biscay, THALASSA stn Z447, 48°47'N, 11°13'W, 1430-1550m. -B. *C. extrema*, Antarctica, Davis Sea, 66°33'S, 93°01'E, 80 m, USNM 613041. Scale lines in μm.

Fig. 13. *Akritogyra*. -A-D. *A. curvilineata*. -A-C. Holotype, diameter 2.3 mm. -D. Off northeastern Iceland, 200 m, diameter 1.3 mm. -E-F. *A. similis*, «*Trochus affinis* JEFFREYS», off Portugal 1993 m, SYKES collection, BMNH, both diameter 2.1 mm.

Fig. 14. -A-B. *Akritogyra similis*. -A. Neotype, diameter 2.2 mm. -B. TRAVAILLEUR 1881, 1685 m, 1.85 mm. -C. *A. conspicua*, possible syntype from MONTEROSATO, SMNH, diameter 1.31 mm. -D. *A. conspicua*, off southern France, BIOMEDE stn 15, diameter 1.8 mm. -E. «*Skenea similis* JEFFREYS» sensu NORDSIECK,

a fresh-water gastropod, diameter 1.6 mm. -F. «*Cyclostrema*» *valvatoides*, topotype, coll. SYKES, BMNH, diameter 3.8 mm.

Fig. 15. Protoconchs and umbilici. -A. *Akritogyra curvilineata*, holotype, diameter 370 μm. -B. «*Cyclostrema*» *valvatoides*, topotype, coll SYKES, BMNH, diameter 440 μm. -C. *A. similis* from TRAVAILLEUR 1881, 1685 m, diameter 290 μm. - D. *A. conspicua*, possible syntype from MONTEROSATO, SMNH, umbilicus. - E. *A. conspicua*, Baie de Calvi, Corsica, 120 m, diameter 265 μm. - G. *A. conspicua*, BIOMEDE stn 15, diameter 260 μm.
Fig. 16. Radulae. -A. *Akritogyra curvilineata*, holotype. -B. *A.* cf. *curvilineata*, off northeastern Iceland, 200 m. Scale lines in μm.

Fig. 17. -A. *Anekes sculpturata*, paratype. -B.-C. *A. undulisculpta*, off Norway, NORBI DS05, 65°22.9'N, 00°02.1'E, 2970 m. -B. Diameter of shell 0.9 mm. -C Diameter of shell 0.6 mm.

Fig. 18. -A-B. *Anekes affinis*. -A . Off Portugal, 1993 m, coll. SYKES, BMNH, diameter 1.34 mm. -B. Lectotype of *Cyclostrema affine* JEFFREYS, height 1.68 mm. -C-D. *A. inflata*, holotype of *Cyclostrema bithynoides* JEFFREYS, diameter 1.51 mm.

Fig. 19. Protoconchs. -A. *Anekes affinis*, off Portugal, 1993 m, coll. SYKES, diameter 280 μm. -B. *A. inflata*, holotype of *Cyclostrema bithynoides* JEFFREYS (not MONTEROSATO), diameter 270 μm. -C. *A. sculpturata*, holotype, diameter 225 μm. -D. *A. paucistriata*, paratype, diameter 230 μm -E. *Retigyra granulosa*, neotype, diameter 220 μm. -F. *Retigyra* sp., umbilical view, BENTHEDI stn 120, southwest of Iles Glorieuses, 11°30'S, 47°24.7'E, 335-390 m, diameter 165 μm (partly concealed).

Fig. 20. -A. *Anekes sculpturata*, holotype, height 1.08 mm. -B-D. *A. paucistriata*. -B. Holotype, front view, height 1.33 mm. -C. Paratype, side view, height 1.41 mm. -D. SEAMOUNT stn PK22, Gorringe Bank, in plankton, height 0.96 mm.

Fig. 21. Radulae. -A. *Anekes paucistriata*, paratype. -B. *Retigyra* sp., BENTHEDI stn 120, SW of Iles Glorieuses, 11°30'S, 47°24.7'E, 335-390 m. Scale lines in μm.

Fig. 22. -A. *Anekes sculpturata*, paratype, diameter 1.04 mm. -B. *A. paucistriata*, paratype, diameter 1.14 mm. -C. *Retigyra granulosa*, former syntype, maximum length of fragment 1 mm. -D-E. *Retigyra granulosa*, neotype, diameter 1.67 mm. -F. *Retigyra* sp., BENTHEDI stn 120, SW of Iles Glorieuses, 11°30'S, 47°24.7'E, 335-390 m, fragment, diameter 0.71 mm.

Fig. 23. *Brookula stibarochila*, topotype, NMNZ MF 12575, Sunday Island, Kermadec, Coll. R.S. Bell. -A. Height 1.4 mm. -B. Diameter of protoconch 245 μm.

Fig. 24. -A-D. *Lissotesta major*, -A. INGOLF Exp. stn 36, height 1.45 mm. -B-D.

Paratypes. -B. Diameter 1.32 mm. -C. Height 1.41 mm. -D. Diameter 1.06 mm; -E. *L. micra*, possible syntype, AMS C 7988, height 1.29 mm.

Fig. 25. Protoconchs and umbilici. -A-B. *Lissotesta micra*, possible syntypes, AMS C 7988. -A. Umbilicus. -B. Protoconch, diameter 225 μm. -C-D. *L. major*, paratype. -C. Umbilicus. -D. Protoconch diameter 405 μm. -E-F. *L. minima*, topotypes of *Trochus minutulus*. -E. Umbilicus. -F. Protoconch, diameter 195 μm. Scale lines in μm.

Fig. 26. Protoconchs. -A. *Lissotesta gittenbergeri*, Baie de Calvi, Corsica, diameter 220 μm. -B. *L. turrita*, Baie de Calvi, Corsica, diameter 220 μm. -C. *Moelleriopsis* sp., off Réunion Island, MD32/DS109, 20°52.3'S, 55°06.3'E, 1050-1240 m, diameter 260 μm. -D. *M. messanensis*, Tuscan Archipelago, diameter 340 μm. -E. *Trochaclis versiliensis*, paratype, diameter 250 μm. -F. T. *antarctica*, Palmer Peninsula, 129 m, USNM 638839, diameter 315 μm.

Fig. 27. Radulae. -A. *Lissotesta major*, Walvis DS05. -B. *Moelleriopsis* sp., off Réunion Island, MD32/DS109, 20°52.3'S, 55°06.3'E, 1050-1240 m.

Fig. 28. Opercula. -A. *Anekes sculpturata*, southeastern Bay of Biscay, 44°36'N, 02°08'W, 230-330 m, diameter 0.54 mm. -B. *Lissotesta major*, Ingolf Exp. stn 36, South of Davis Strait, 61°50'N, 56°50'W, 2612 m, diameter 0.71 mm. -C. *Moelleriopsis* sp, MD32/DS109, 20°52.3'N, 55°06.3'E, 1050-1240 m, off Réunion Island, diameter 0.84 mm. -D. *Trochaclis antarctica*, Antarctica, Palmer Peninsula, 67°53'S, 69°10.5'W, 300 m, diameter, 1.17 mm, USNM 678873. -E-F. *Lodderena catenoides*, Acitrezza, Sicily, 36 m, in- and outside respectively, diameter 0.48 and 0.55 mm.

Fig. 29. -A-C. 39. *Lissotesta minima*, off Portugal, 1993 m, coll Sykes, BMNH. -A. Height 1.51 mm. -B. Diameter 1.00 mm. -C. Diameter 0.88 mm. -D-F. *L. gittenbergeri*, Baie de Calvi, Corsica. -D. Height 0.71 mm. -E. Diameter 0.60 mm. -F. Diameter 0.58 mm.

Fig. 30. -A-F. *Lissotesta turrita*. -A. Off Korsfjorden, western Norway, height 0.74 mm. -B-F. Baie de Calvi, Corsica. -B. Height 0.63 mm. -C. Diameter 0.65 mm. -D. Diameter 0.65 mm. -E-F. Diameter 0.66 mm.

Fig. 31. -A. *Moelleriopsis* sp., off Réunion Island, MD32/DS109, 20°52.3'N, 55°06.3'E, 1050-1240 m, shell diameter 1.60 mm. -B-D. 45. *M. messanensis*, Tuscan Archipelago. -B. Diameter 2.1 mm. -C. Diameter 2.4 mm. -D. Diameter 2.2 mm. -E. *Granigyra limata*, holotype, USNM 214280, diameter 2.2 mm.

Fig. 32. Protoconchs and umbilici. -A-B. *Granigyra tenera*, topotype, coll. Sykes, BMNH. -A. Umbilicus. -B. Protoconch, diameter 235 μm. -C-D. *G. pruinosa*, Bay of Biscay, INCAL WS04, 48°18.6'N, 15°13.8'W, 4829 m, diameter 555 μm. -E-F. *G. granulifera*. -E. San Procopio, Italy, Pleistocene, diameter 260 μm. -F. Abyplaine stn CP11, diameter 300 μm. Scale lines in μm.

Fig. 33. -A. *Granigyra tenera*, off Portugal, 1993 m, coll. Sykes, BMNH, diame-

ter 1.8 mm. -B. *Ganesa nitidiuscula*, syntype, BMNH 1986.193, height 2.4 mm. -C. *Granigyra pruinosa*, Bay of Biscay, INCAL WS04, 48°18.6'N, 15°13.8'W, 4829 m, shell height 6.2 mm. -D. *Granigyra pruinosa*, off Portugal, 1993 m, coll. SYKES, BMNH, height 2.5 mm.

Fig. 34. Radulae. -A. *Granigyra pruinosa*, Bay of Biscay, INCAL WS04, 48°18.6'N, 15°13.8'W, 4829 m. -B. *G. granulifera*, ABYPLAINE DS11. The numbers on the teeth indicate their position with the central tooth as number 1. Scale lines in μm.

Fig. 35. -A-E. *Granigyra granulifera*. -A-C. Off southeastern France, BIOMEDE stn 4. -A. Diameter 1.64 mm. -B. Height 1.61 mm. -C. Height 1.57 mm. -D. ABYPLAINE DS11, height 1.34 mm. -E. San Procopio, Italy, fossil, height 1.37 mm.

Fig. 36. -A-D. *Trochaclis versiliensis*. -A-C. Tuscan Archipelago. -A. Height 1.27 mm. -B. Diameter 1.37 mm. -C. Diameter 1.16 mm. -D. Galicia Bank, off northwestern Spain, SEAMOUNT stn DW116, height 1.68 mm. -E. 48. *T. antarctica*, Antarctica, Palmer Peninsula, 67°53'S, 69°10.5'W, 300 m, USNM 678873, height 2.0 mm.

Fig. 37. *Trochaclis antarctica*, radula, Palmer Peninsula, USNM 638839. -A. Detail of central field. -B. Overview. Scale lines in μm.

Fig. 38. *Trochaclis antarctica*, details of radula USNM 638839. -A. Outer part of teeth. -B. End of teeth. Scale lines in μm.

Fig. 39. -A-C. *Lissomphalia bithynoides*, Baie de Calvi, Corsica, 70-150 m. -A. Height 0.98 mm. -B. Diameter 1.00 mm. -C. Diameter 0.75 mm. -D. «*Anekes*» cf. *giustii*, off northwestern Iceland, diameter 0.74 mm. -E-F. *Moelleria costulata*, western Norway, glacial fossil. -E. Diameter 1.45 mm. -F. Diameter 2.0 mm.

Fig. 40. -A-B. *Lissomphalia bithynoides*, Baie de Calvi, 70-150 m. -A. Protoconch, diameter 175 μm. -B. Umbilicus. -C-D. *Moelleriopsis abyssicola*, holotype, USNM 52496, diameter 3.12 mm. -E. *Pseudorbis granulum*, Palermo, BMNH, height 0.81 mm. -F-H. *Abyssogyra vemae*, holotype , MCZ 224962, diameter 1.80 mm. Scale line in μm.

Fig. 41. -A-C. *Xylodiscula boucheti*. -A-B. Holotype, diameter 1.70 mm. -C. Tuscan Archipelago, diameter 1.70 mm. -D. Baie de Calvi, Corsica, diameter 1.73 mm. -E-F. *X. lens*, holotype, diameter 1.70 mm.

Fig. 42. -A. *Xylodiscula boucheti*, Tuscan Archipelago, 1.38 mm. -B. *X. boucheti*, Baie de Calvi, Corsica, 1.43 mm. -C. *X. lens*, holotype, 1.70 mm. -D. *X. lens*, Baie de Calvi, Corsica, 0.84 mm.

Fig. 43. *Xylodiscula boucheti*, radula. Scale line in μm.

Fig. 44. *Xylodiscula boucheti*, crawling animal. Diameter of shell 1.7 mm.

Fig. 45. Protoconchs. -A-B. *Xylodiscula boucheti*. -A. Baie de Calvi, Corsica, visible diameter 165 μm. -B. Tuscan Archipelago, diameter 255 μm. -C-D. *X. lens*, Calvi, Corsica, diameter 215 μm.

Fig. 46. *Skenea (Lissopsira) basistriata*, radula, Bay of Biscay, 47°36.1'N, 08°40.5'W, 2360 m. -A. Half the radula. -B. Oblique, lateral view of transition between lateral and marginal teeth. The numbers indicate the sequence of the teeth with the central tooth as number 1. Scale lines in μm.

Fig. 47. *Skenea* and *Cirsonella*. -A. *Cirsonella romettensis*, Pantellaria, 710 m, coll SYKES, BMNH, diameter 1.13 mm. -B-D. *Skenea basistriata*. -B. Off Portugal, 1993 m, coll SYKES, BMNH, diameter 1.28 mm. -C-D. Bay of Biscay, 47°36.1'N, 08°40.5'W, 2360 m. -C. Diameter 2.4 mm. -D. Diameter of protoconch 520 μm.

## INDEX OF NAMES MENTIONED IN THE TEXT

Present allocation of the taxon is given within brackets

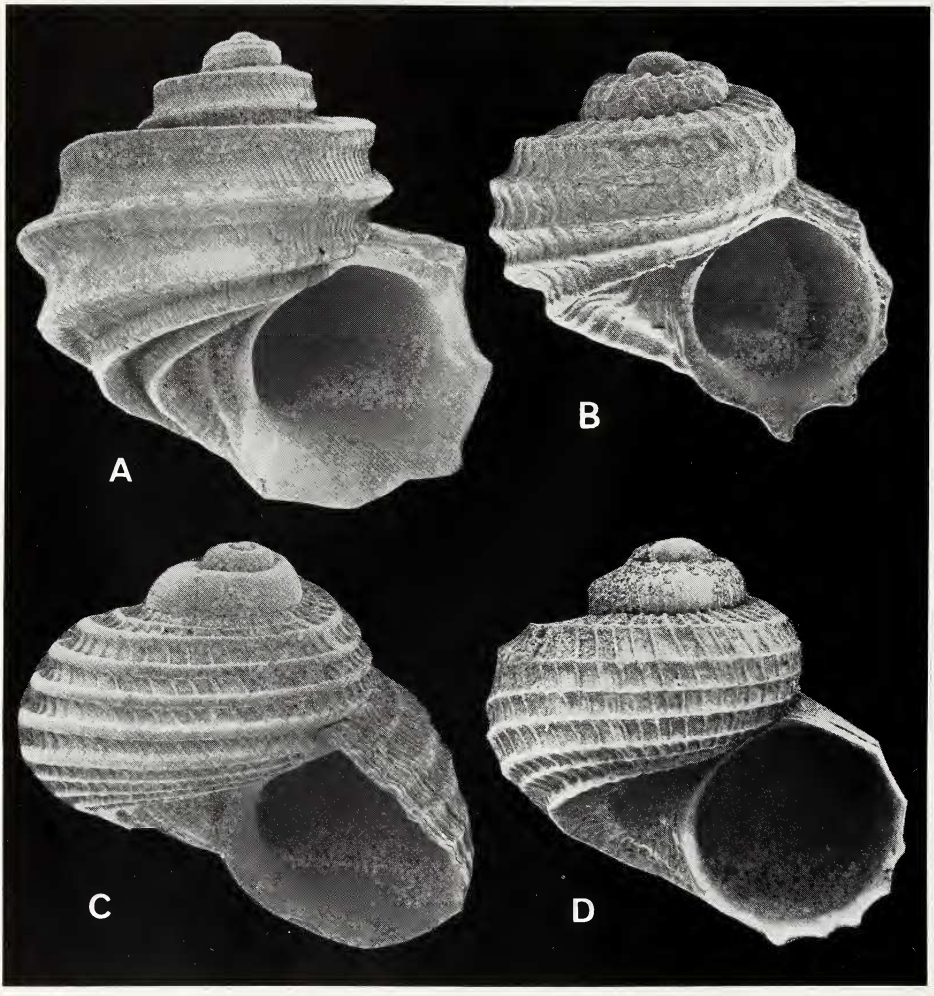



Fig. 1

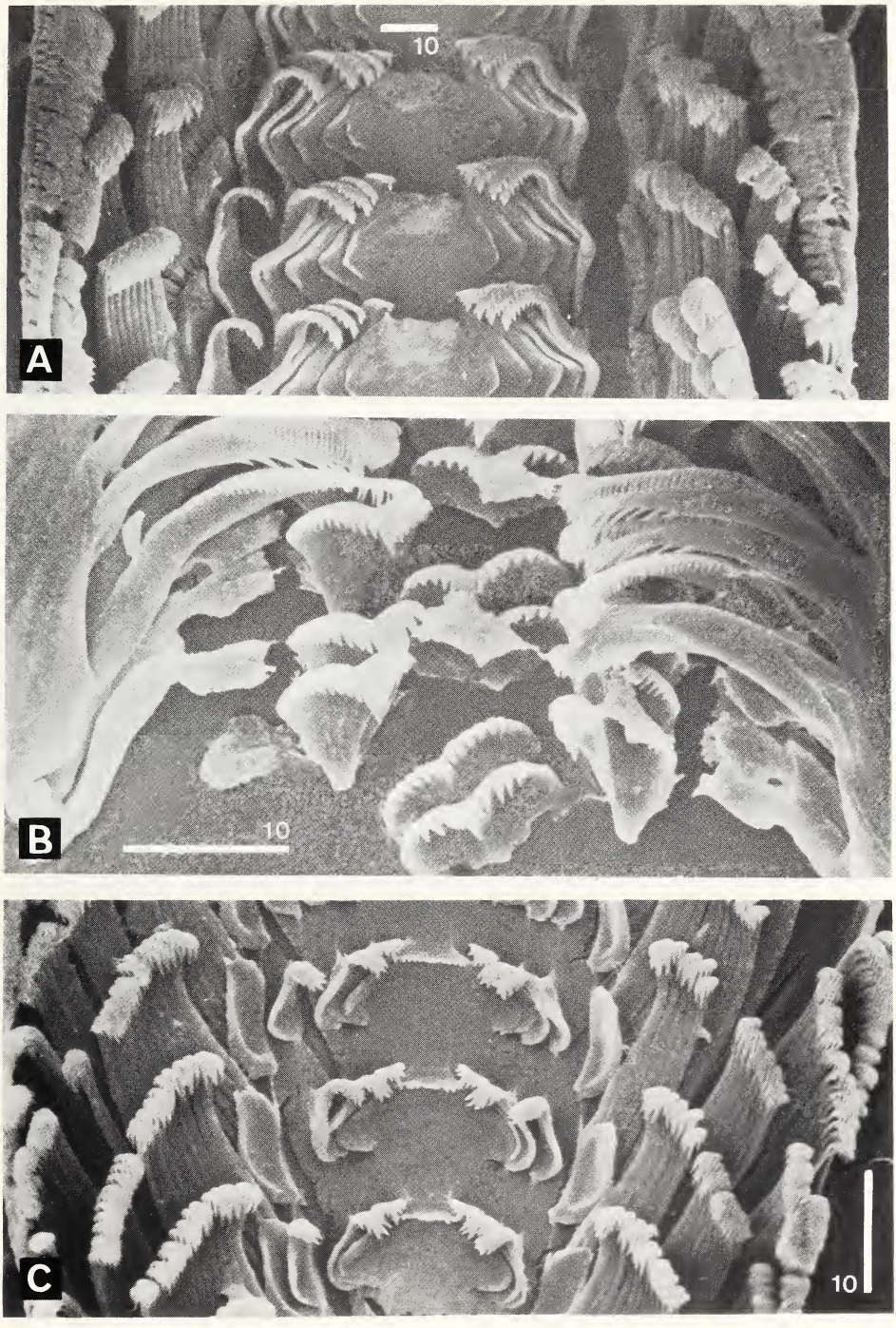
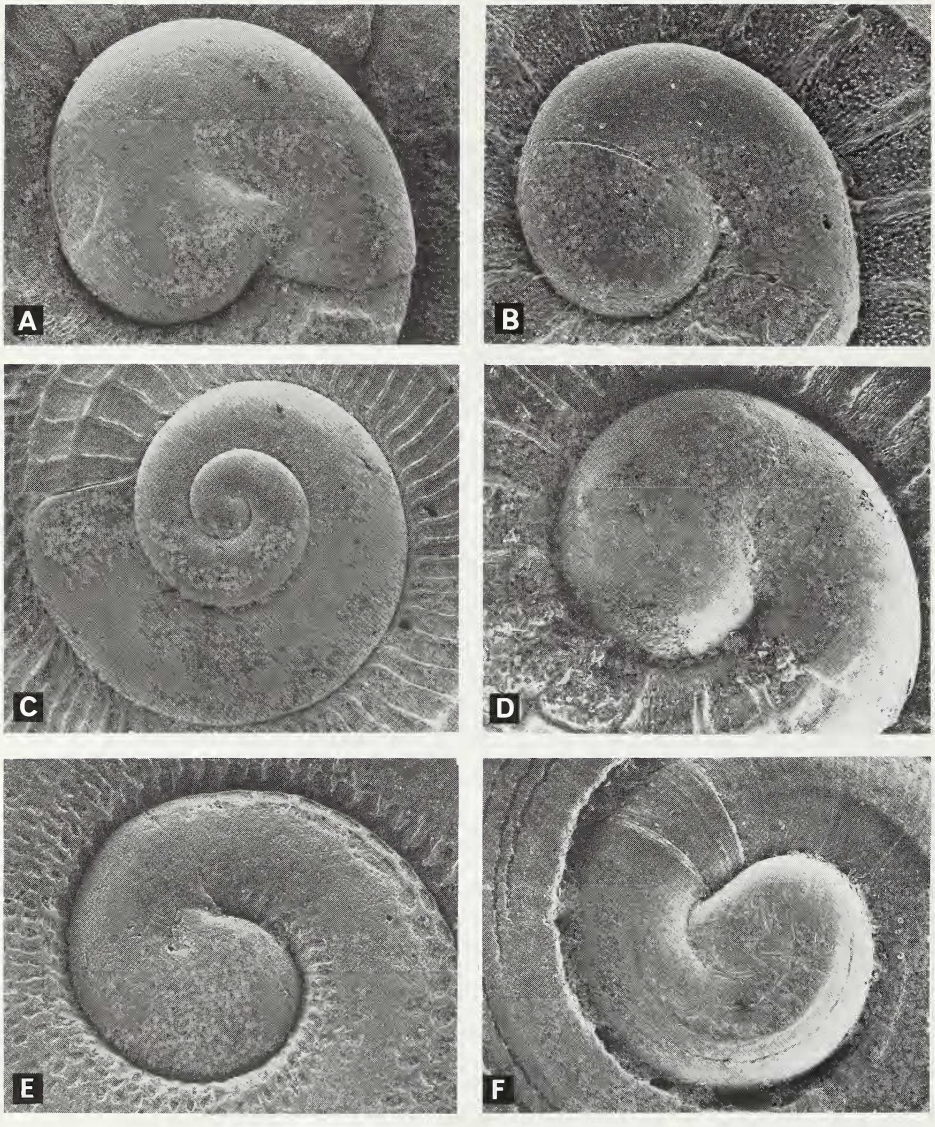



Fig. 2

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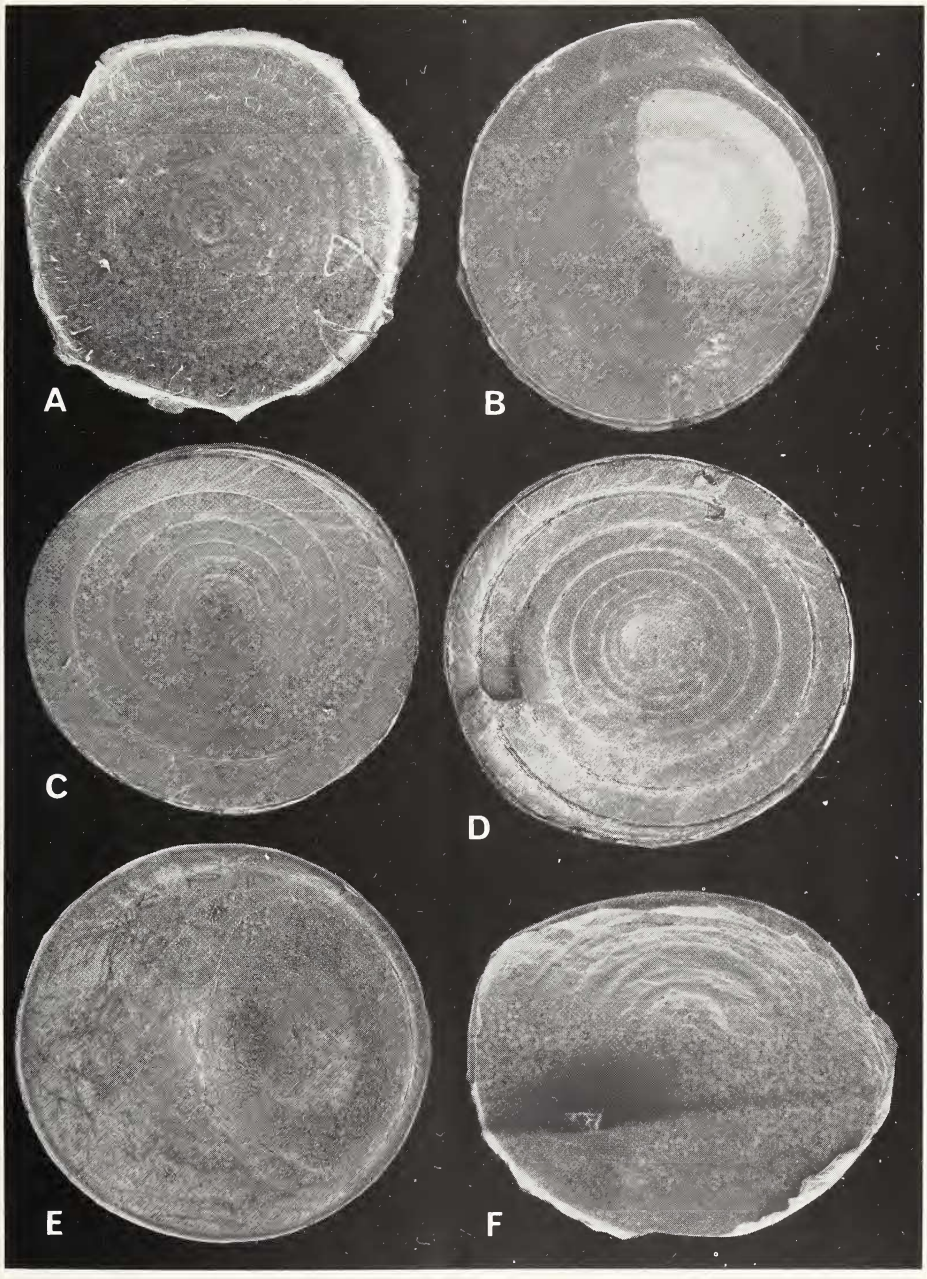


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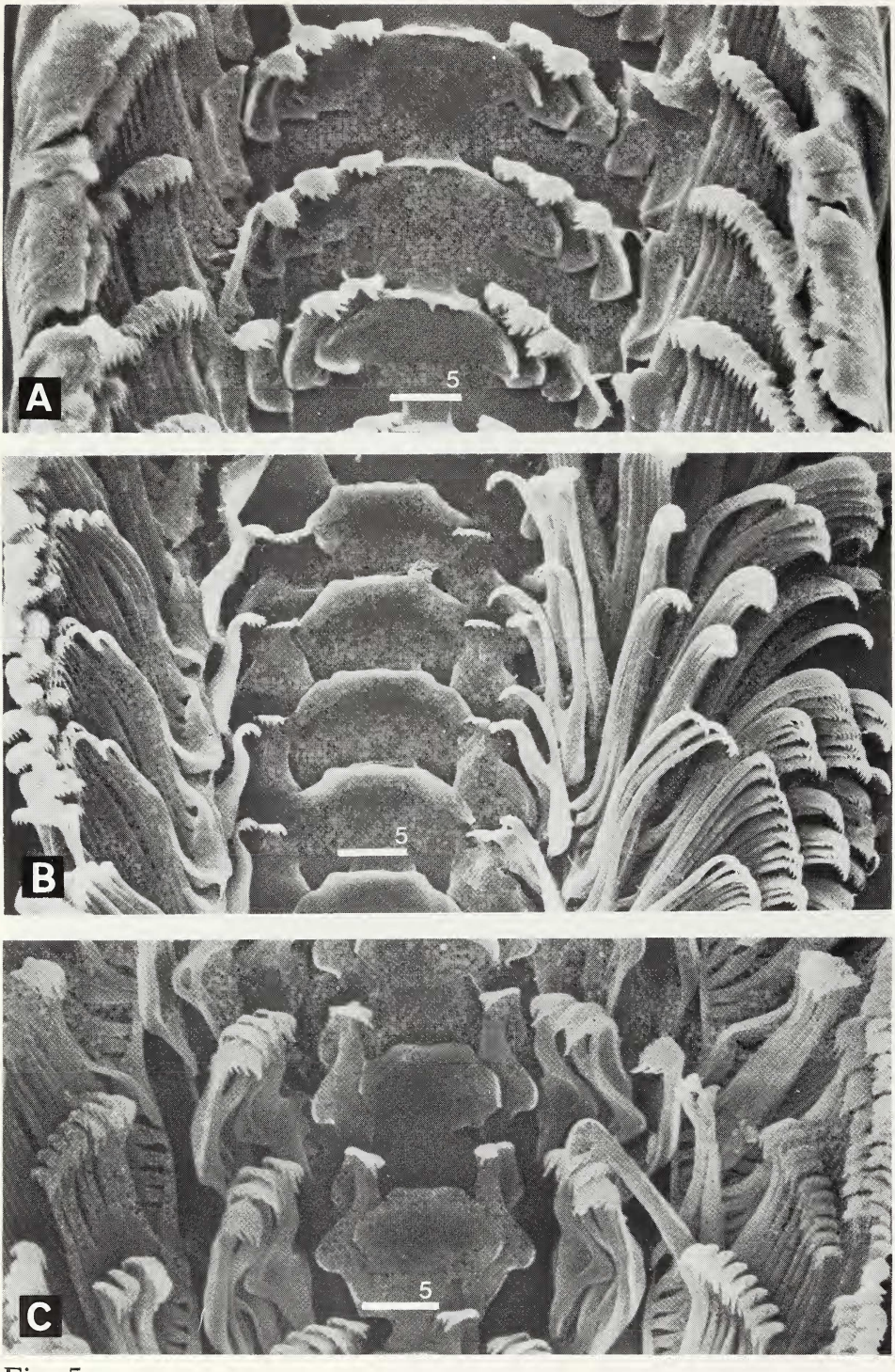


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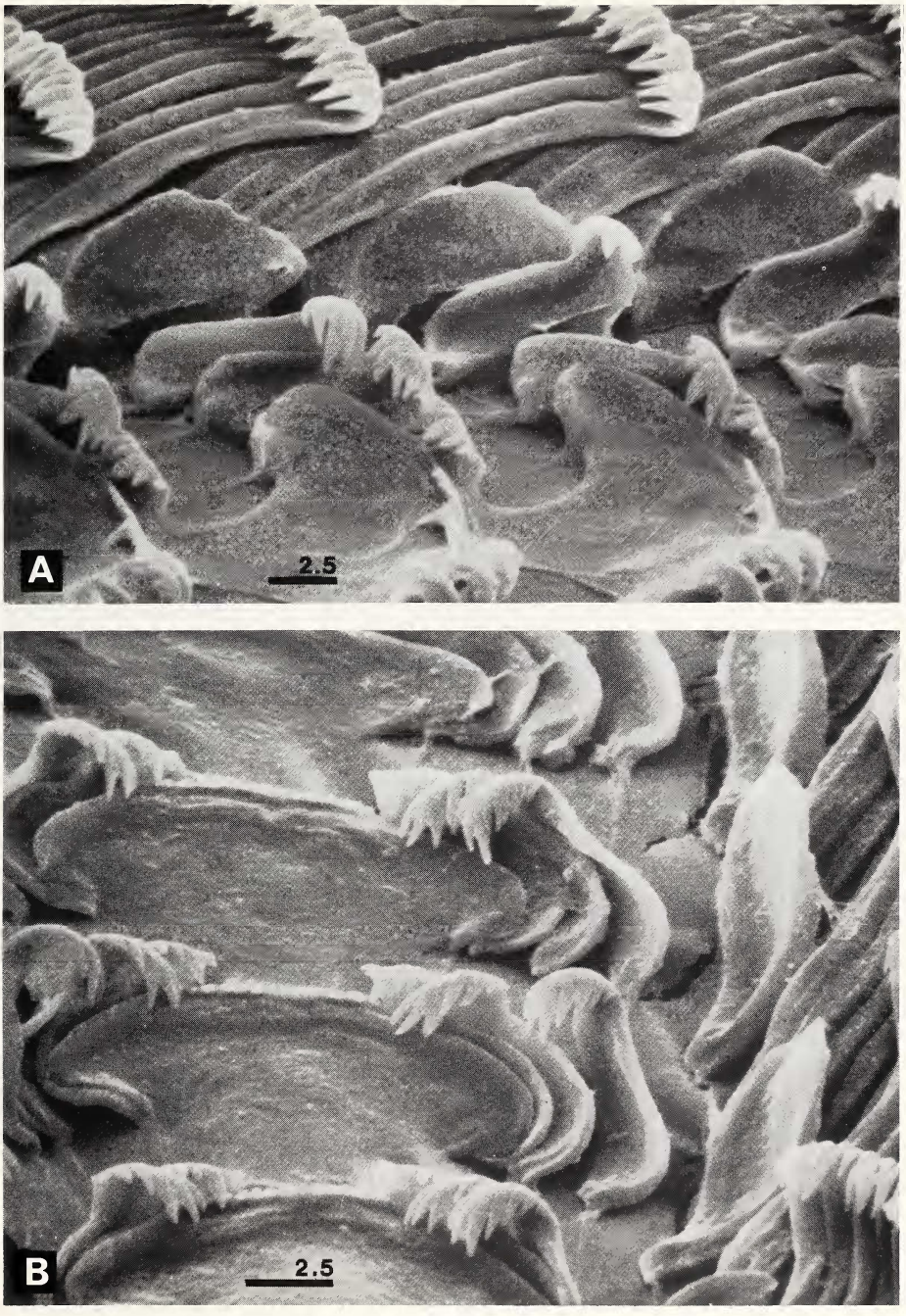


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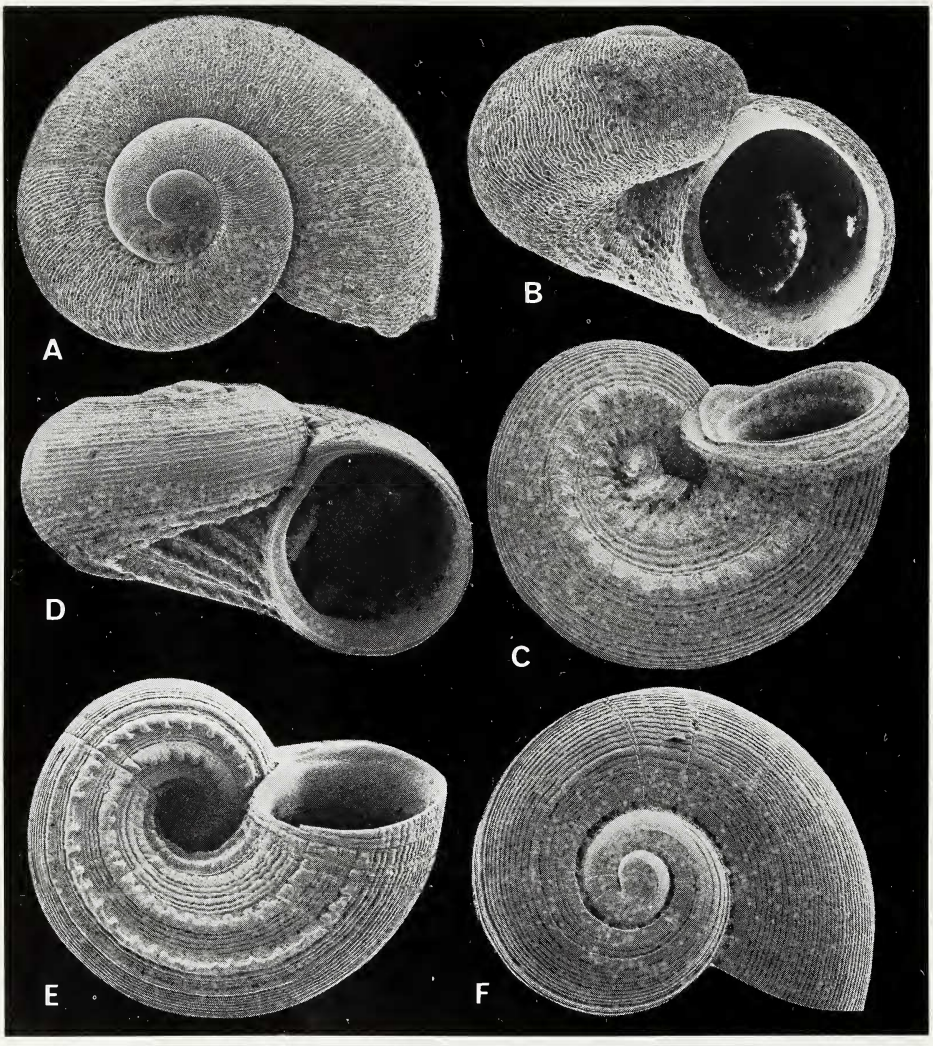



Fig. 7

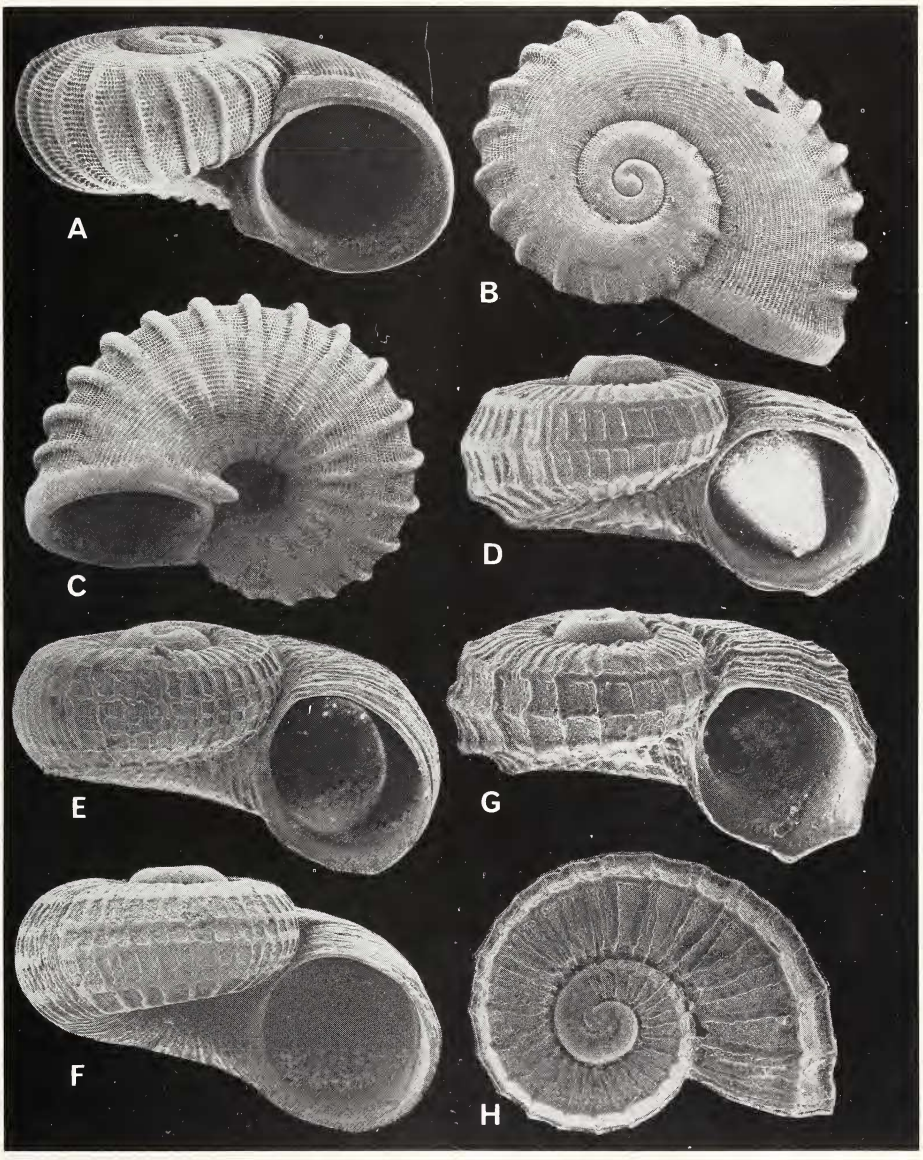



Fig. 8

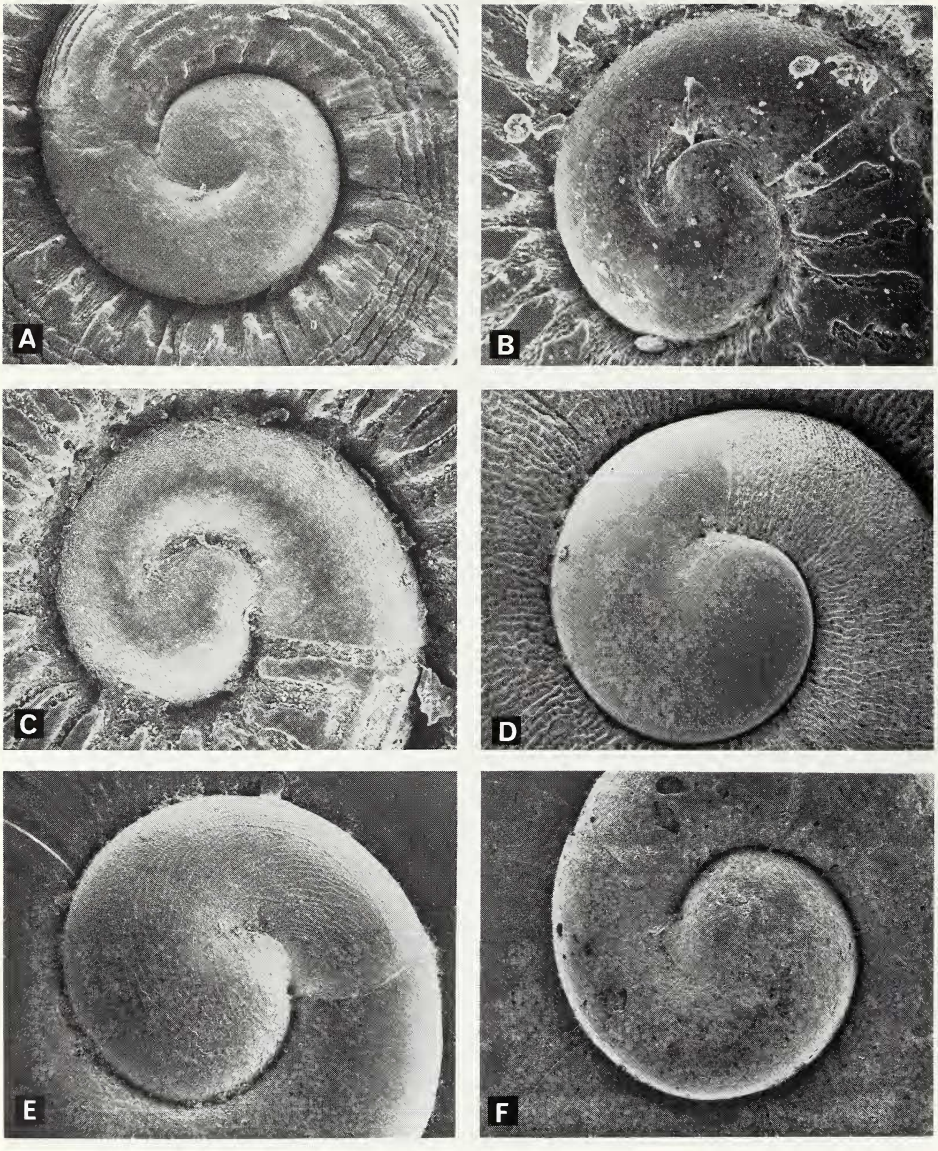



Fig. 9

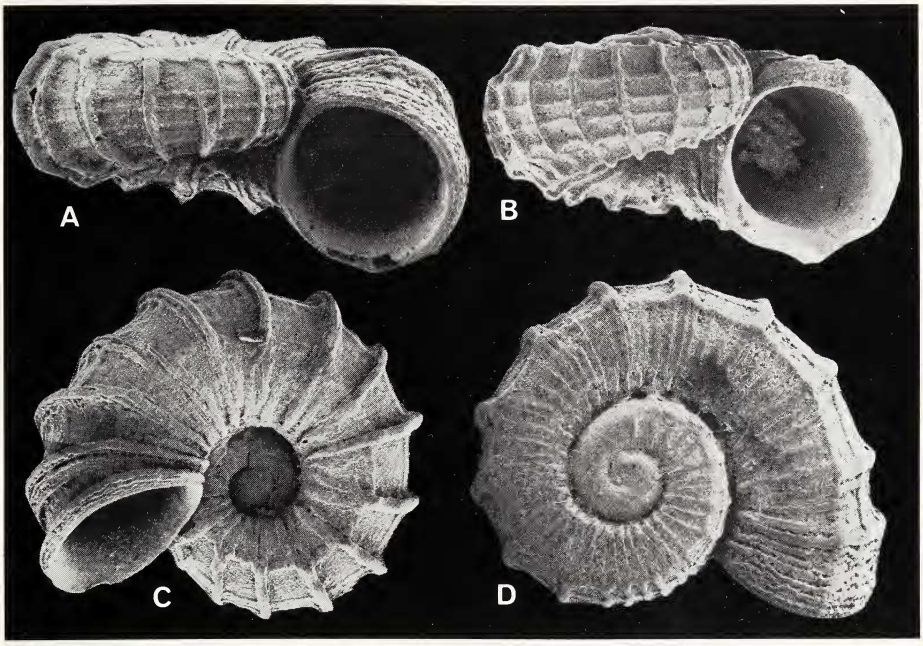



Fig. 10

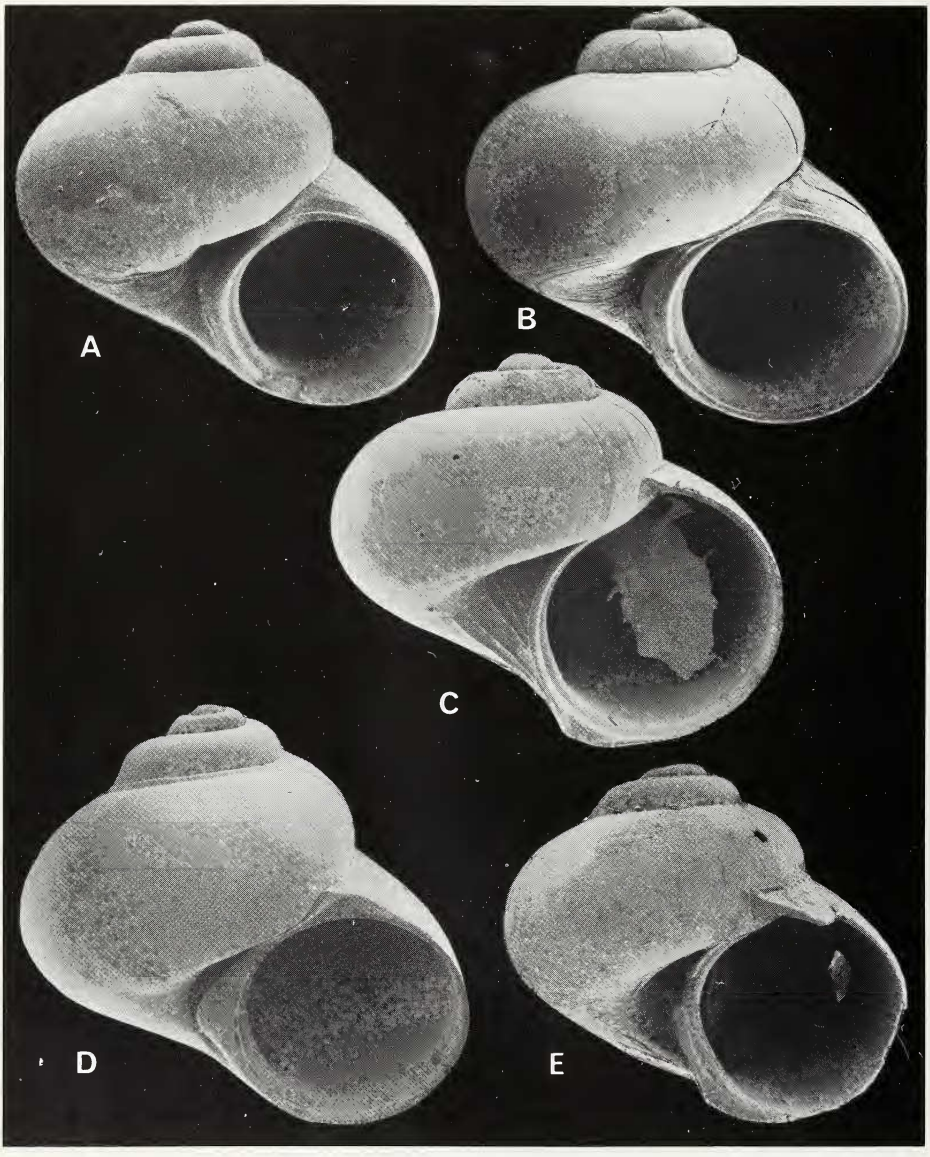



Fig. 11

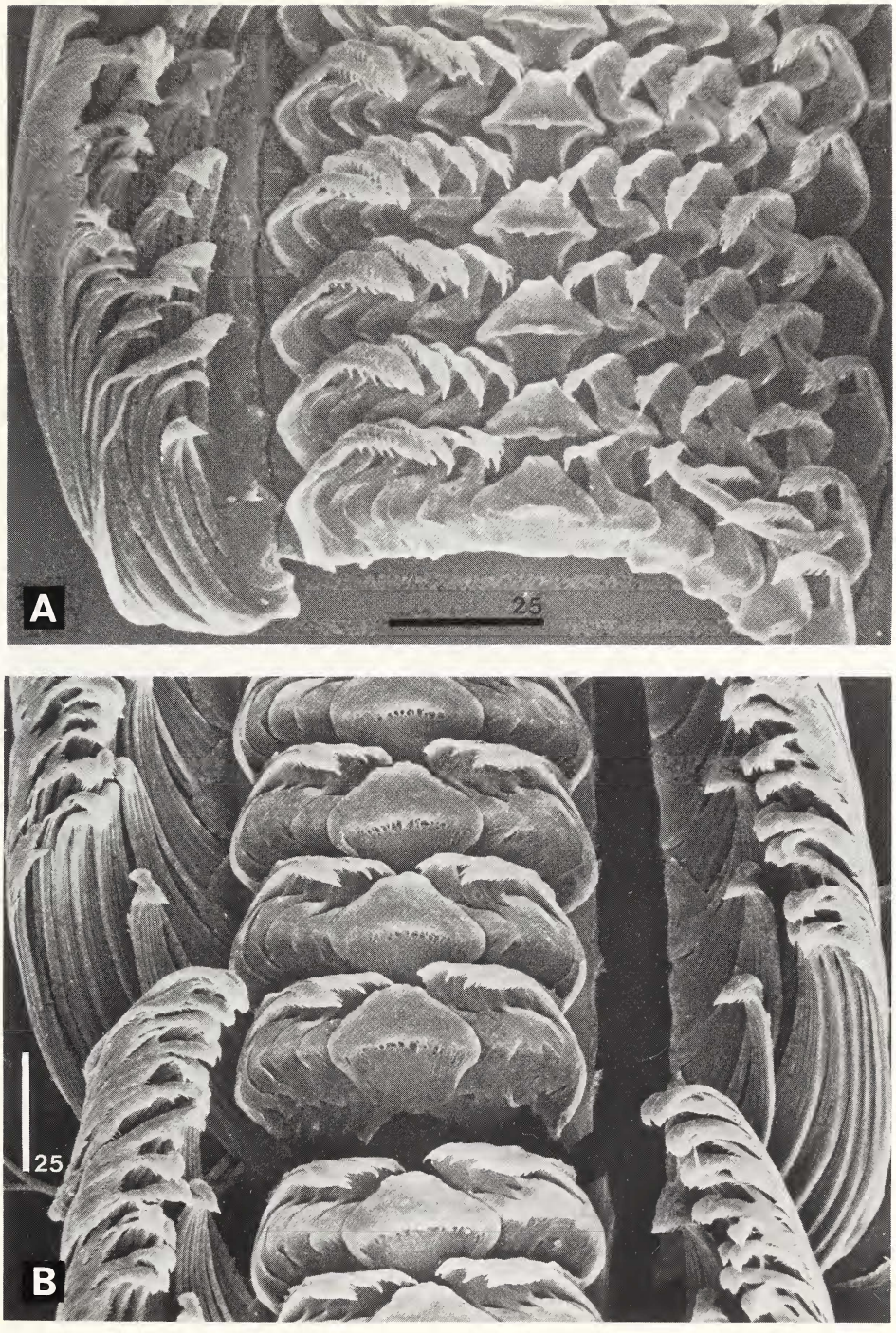



Fig. 12

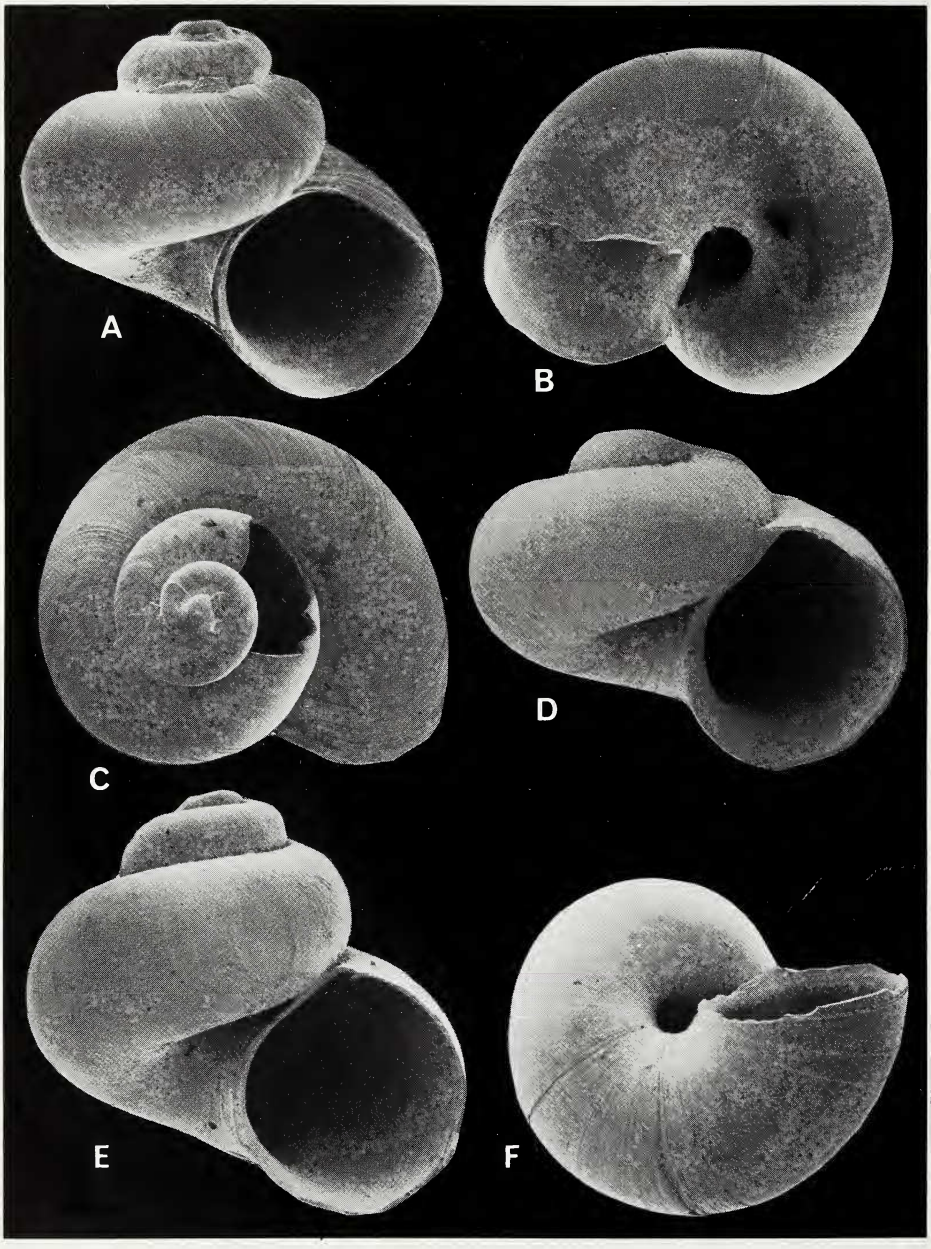



Fig. 13

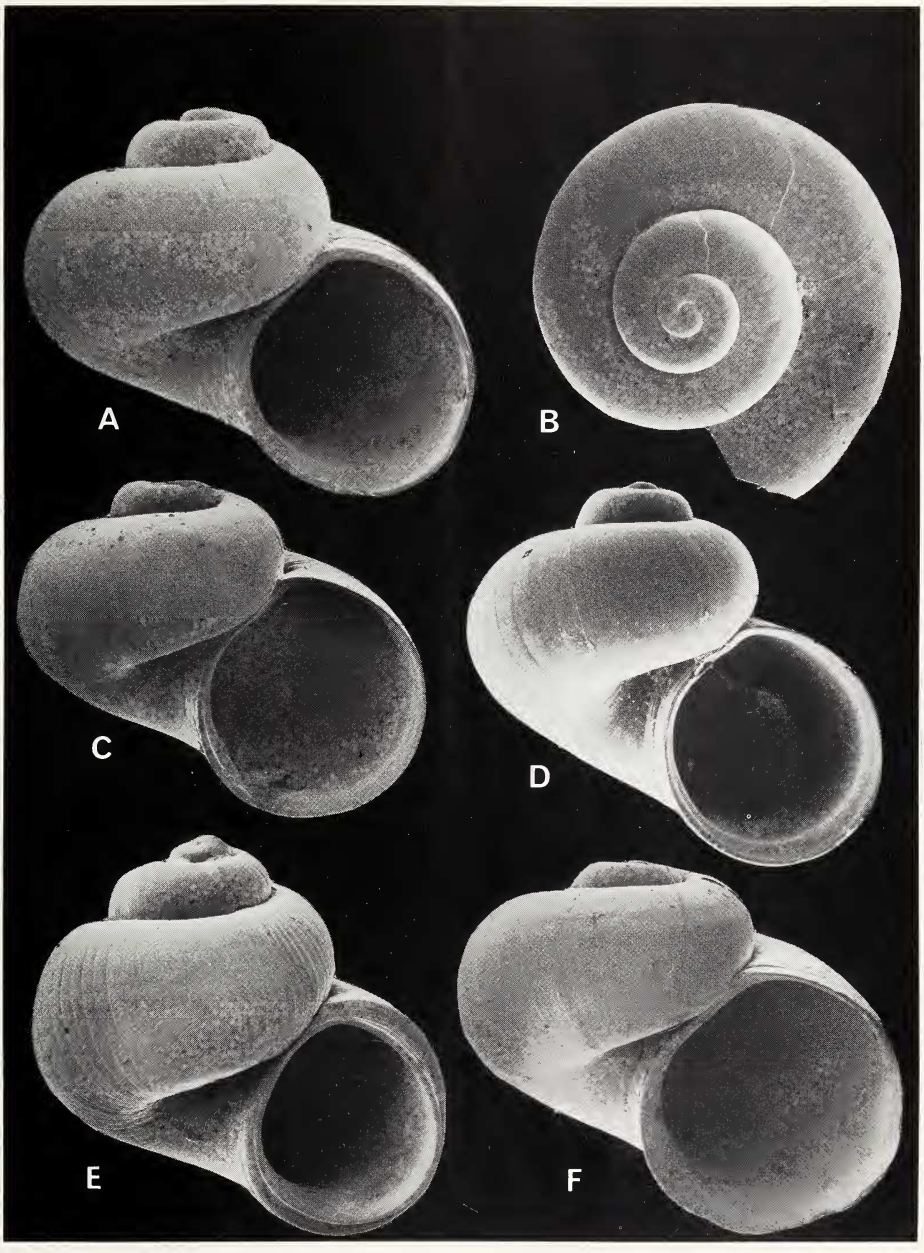



Fig. 14

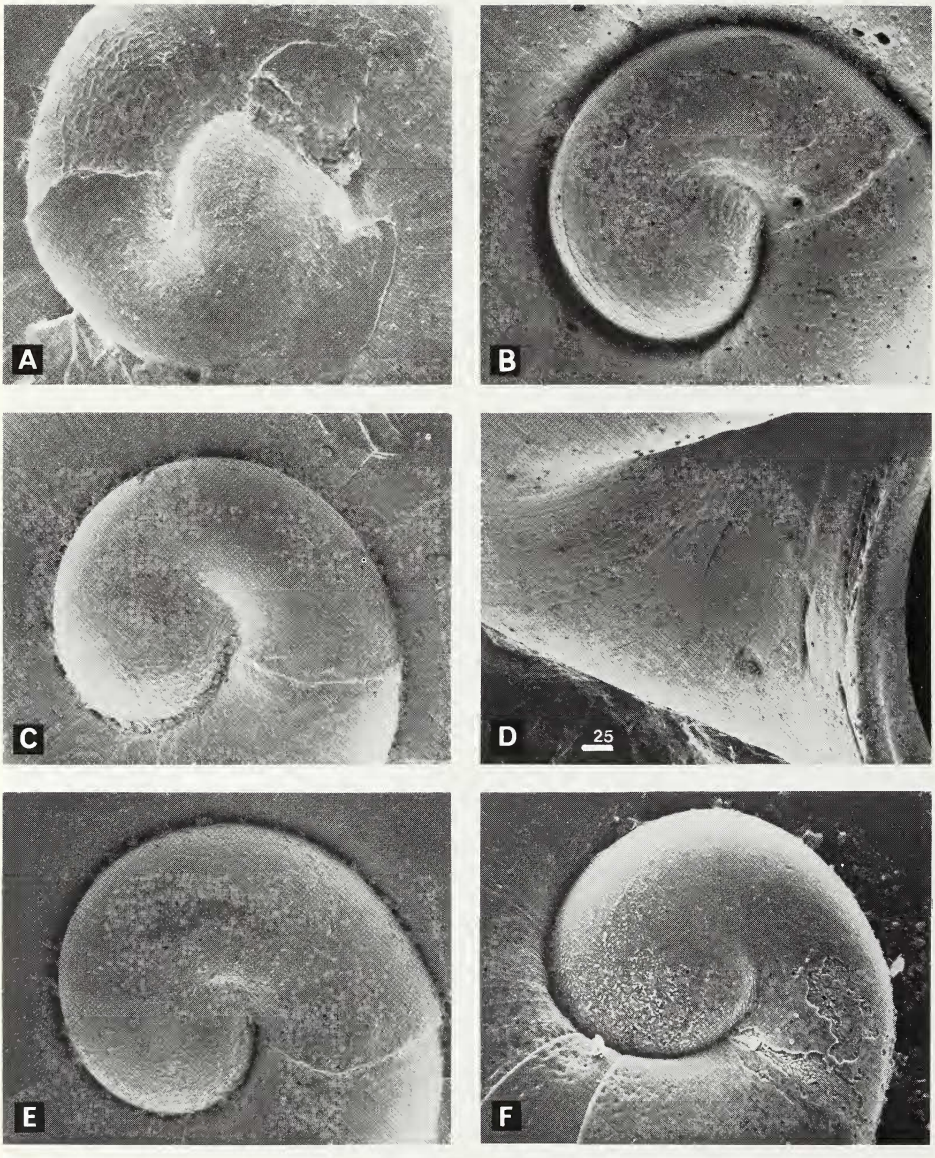



Fig. 15

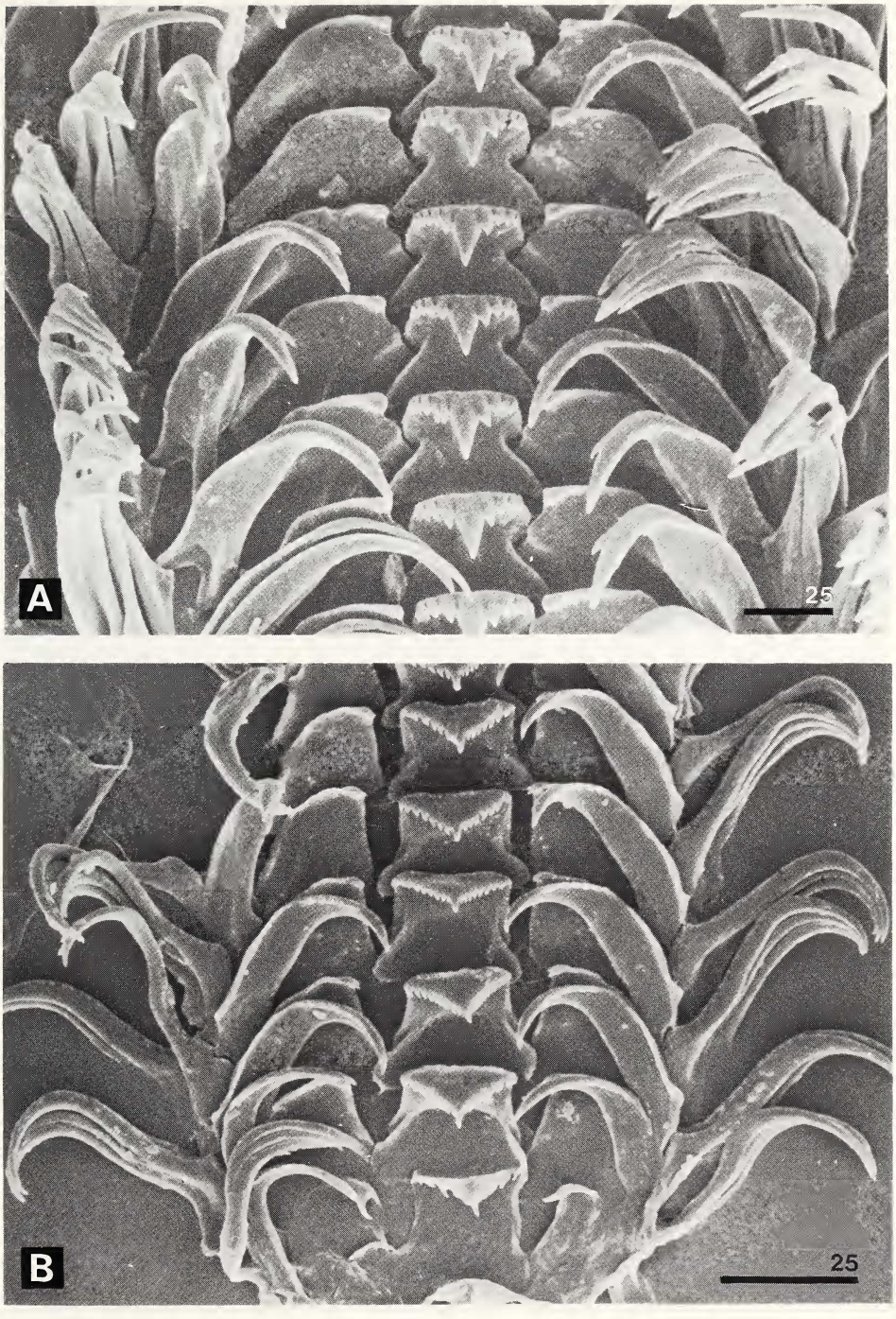



Fig. 16

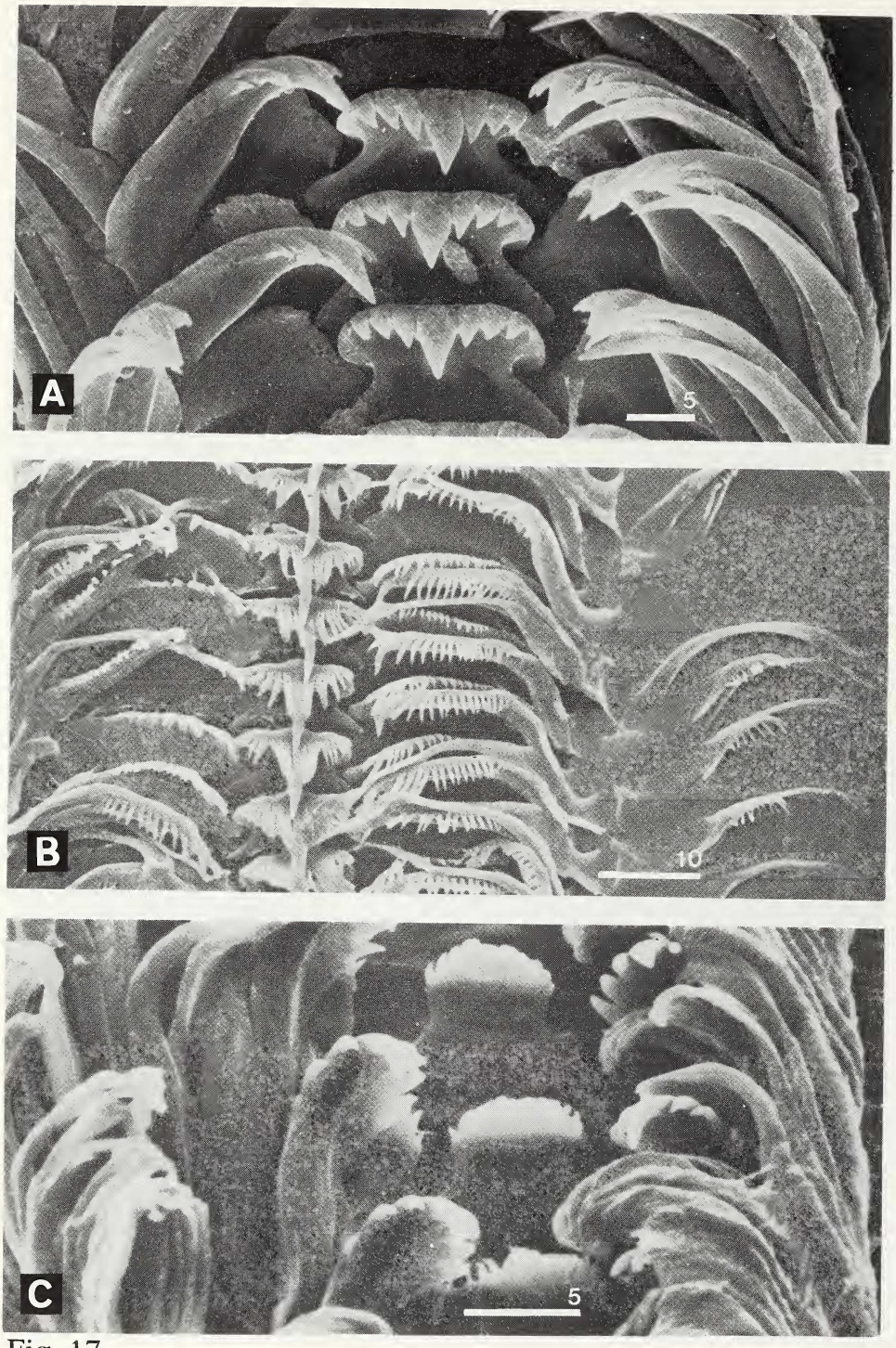


Fig. 17

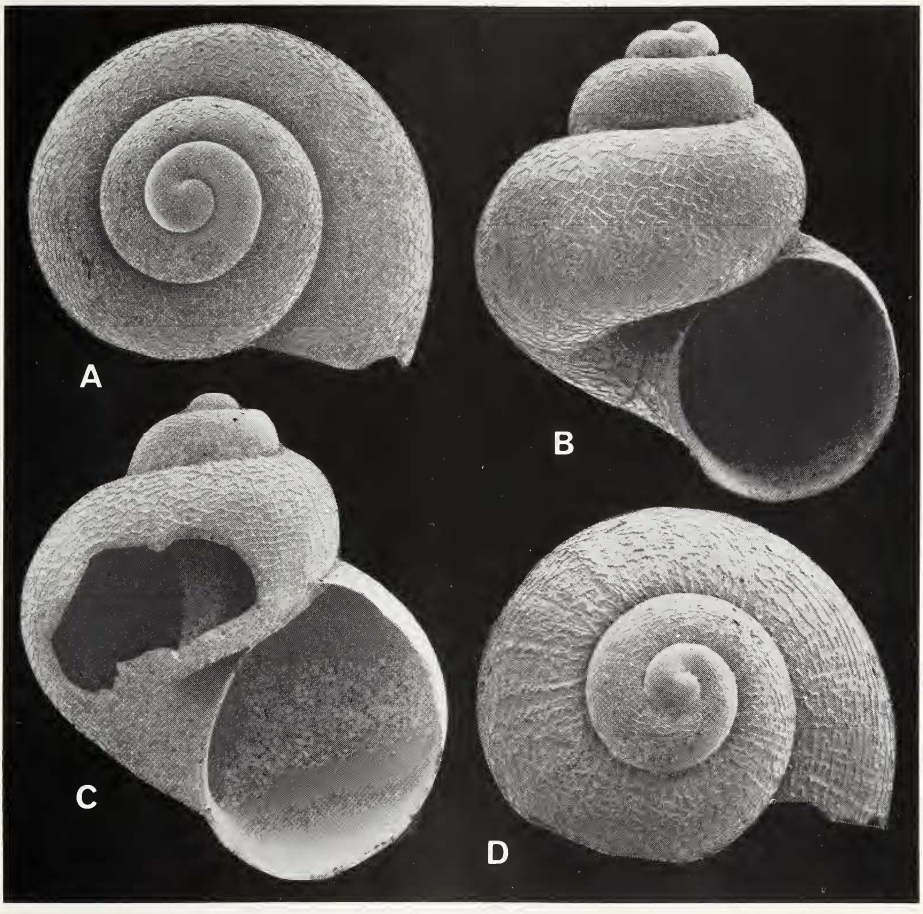
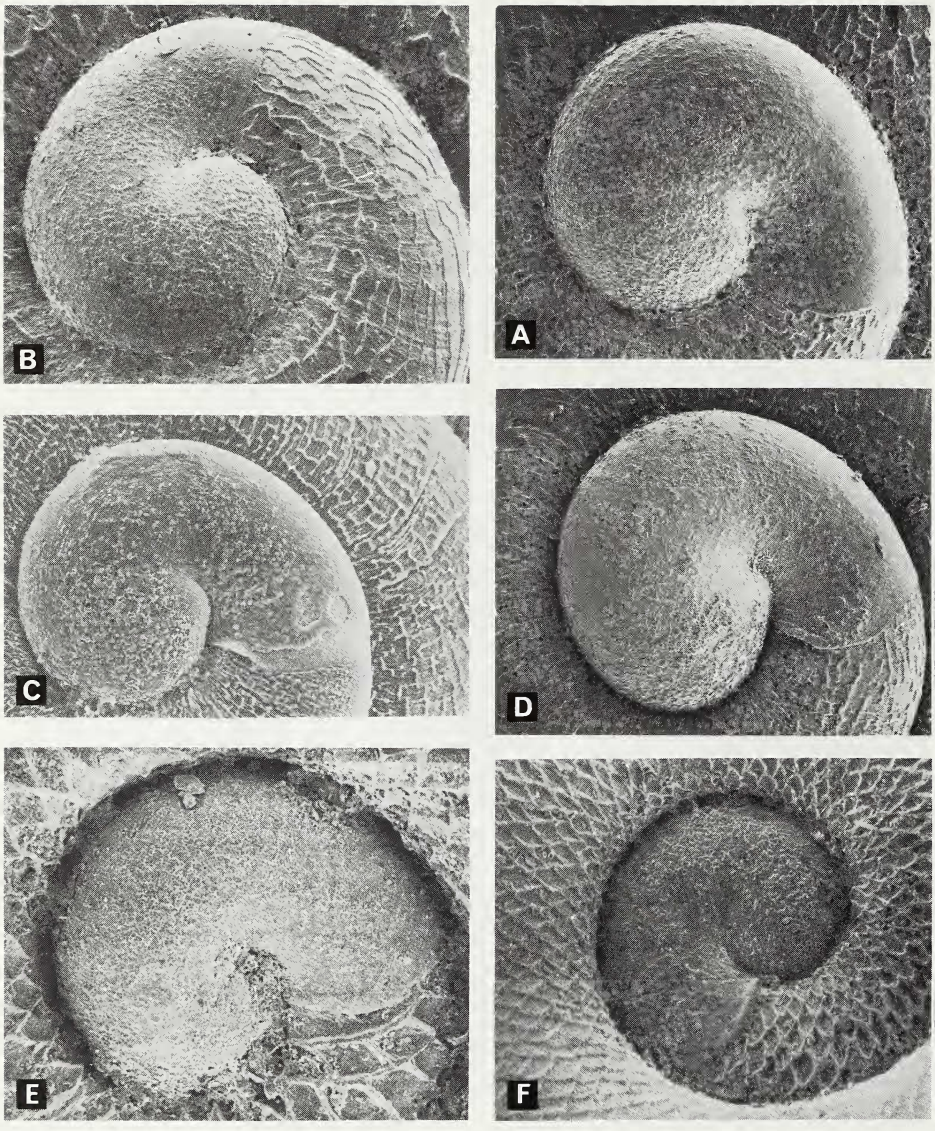



Fig. 18

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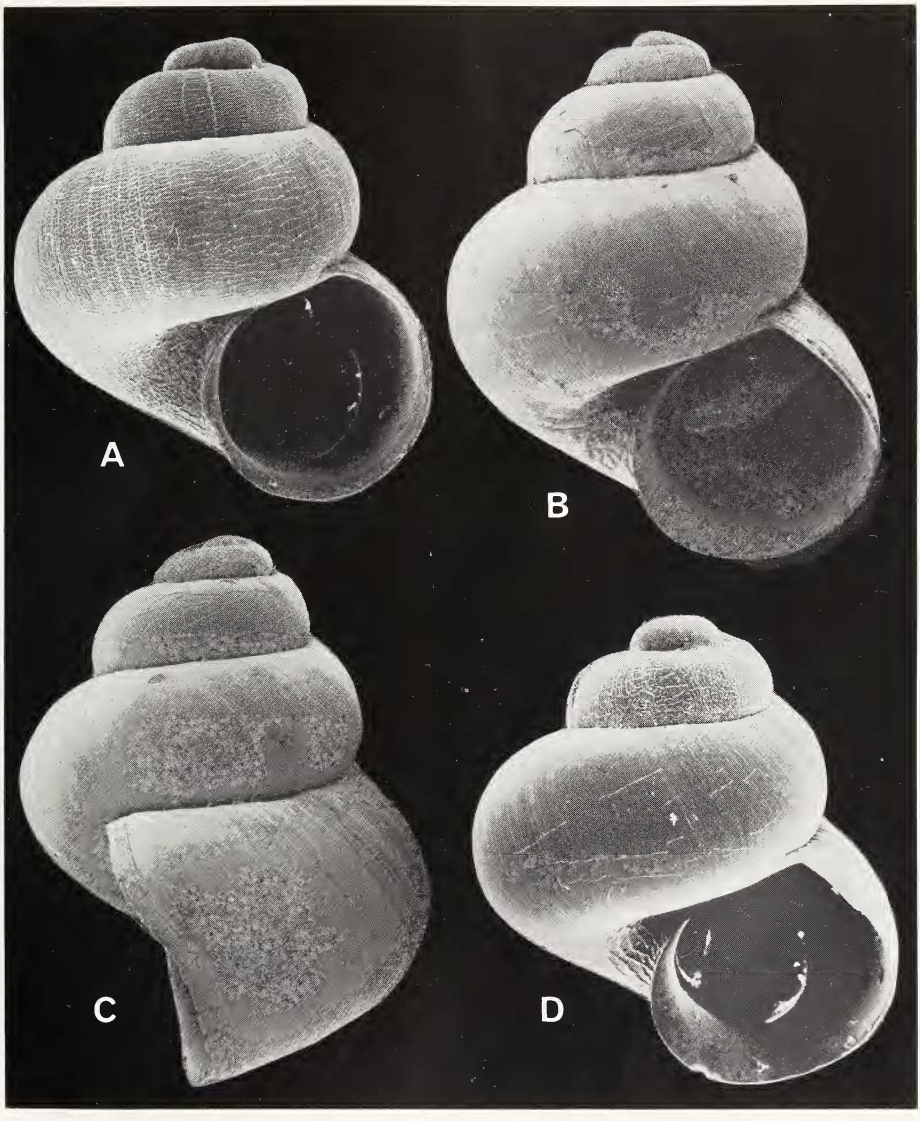



Fig. 20

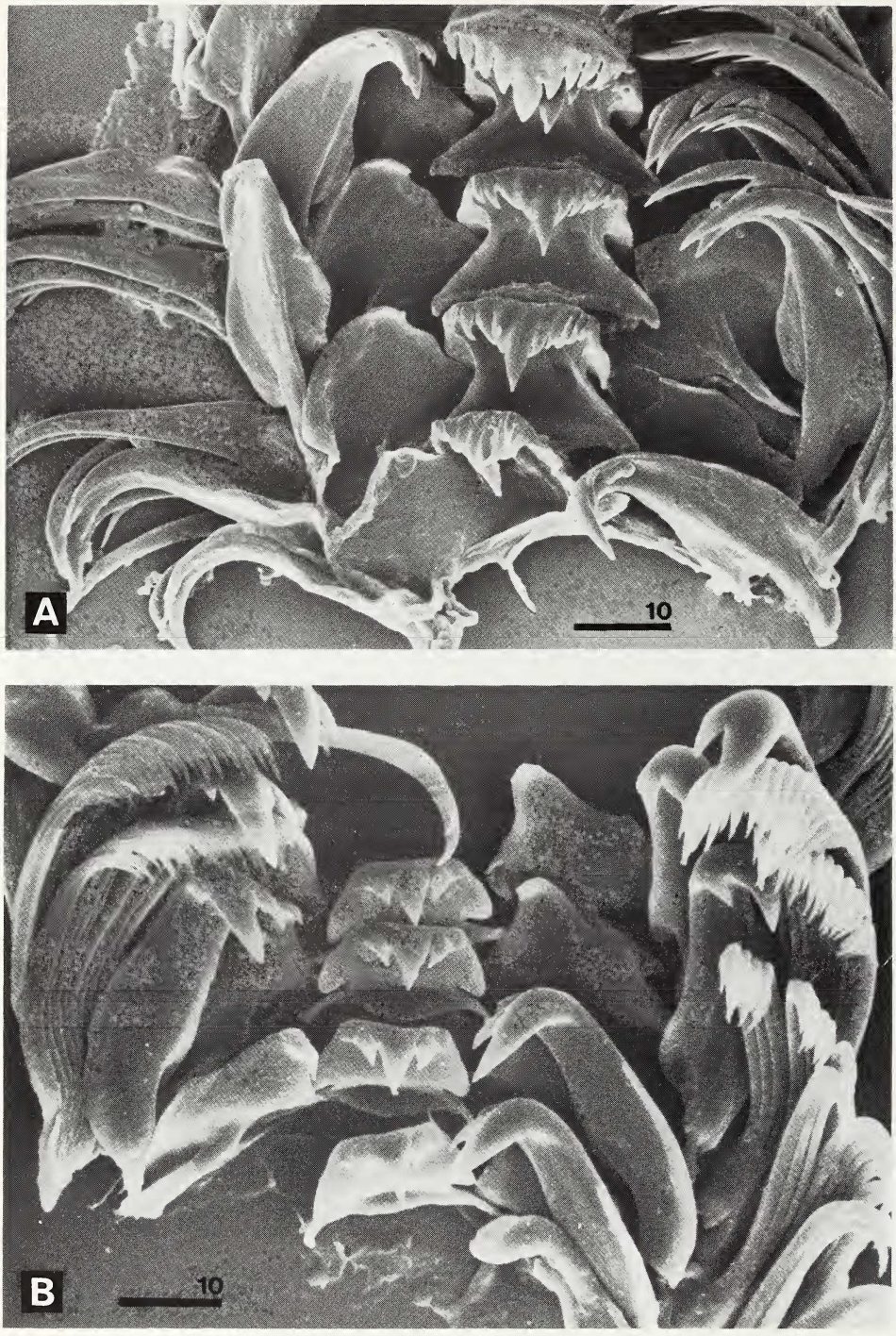



Fig. 21

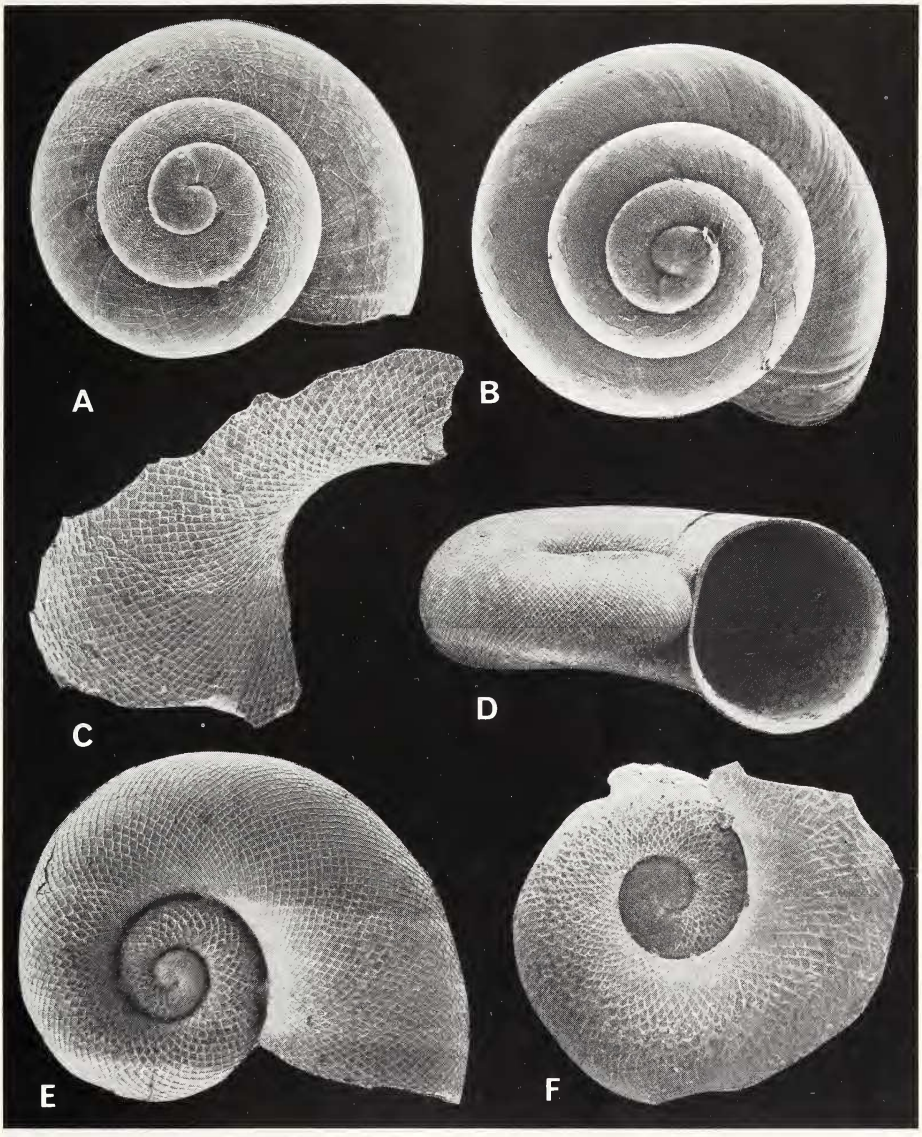



Fig. 22

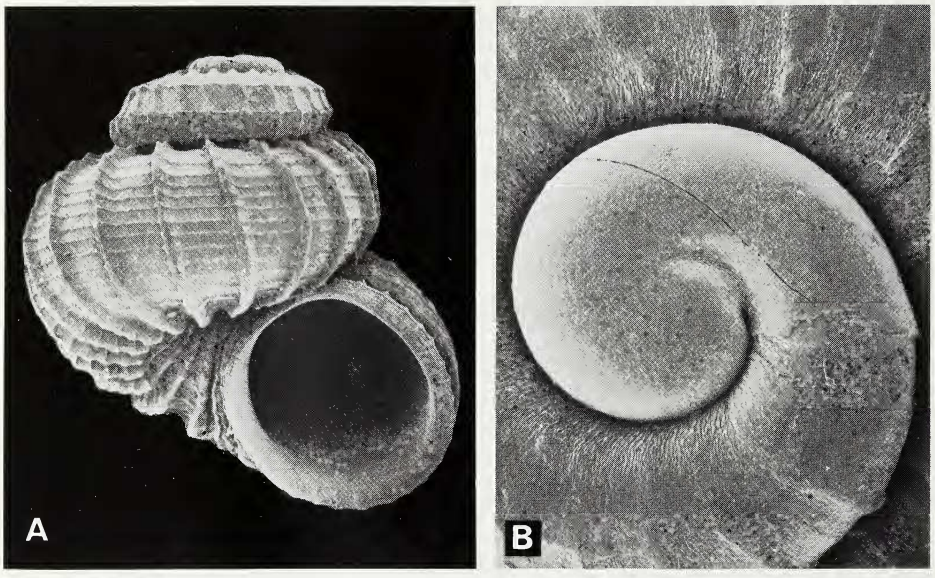



Fig. 23

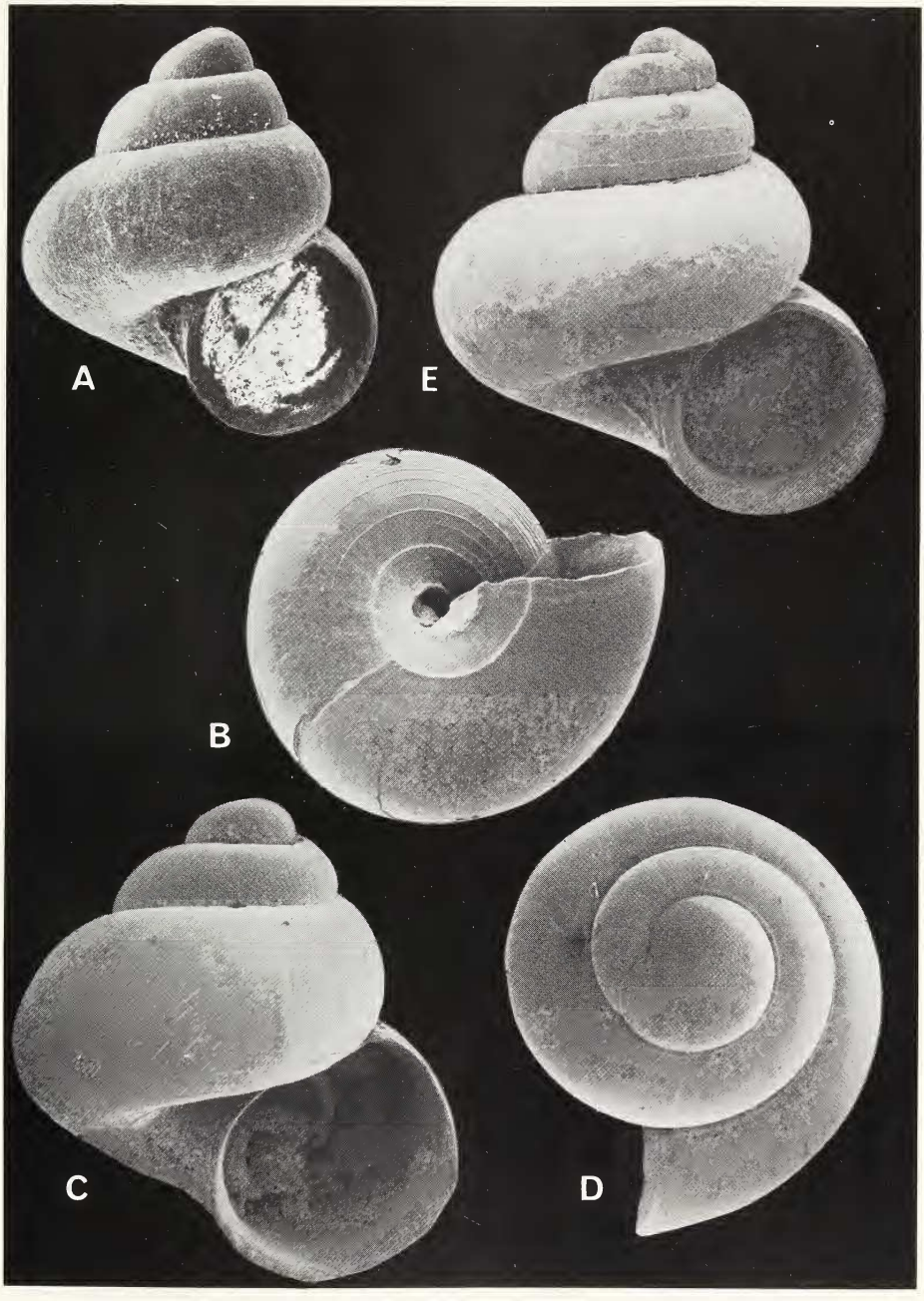
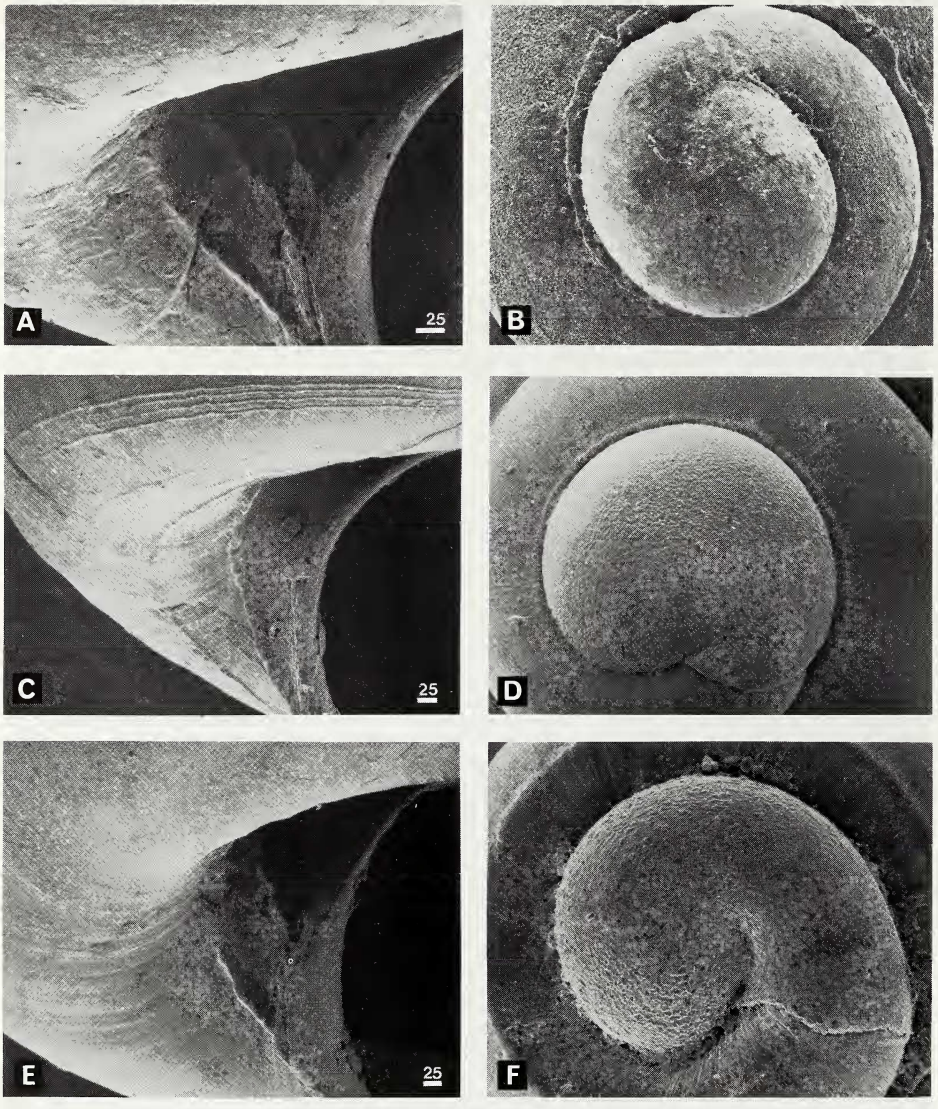



Fig. 24

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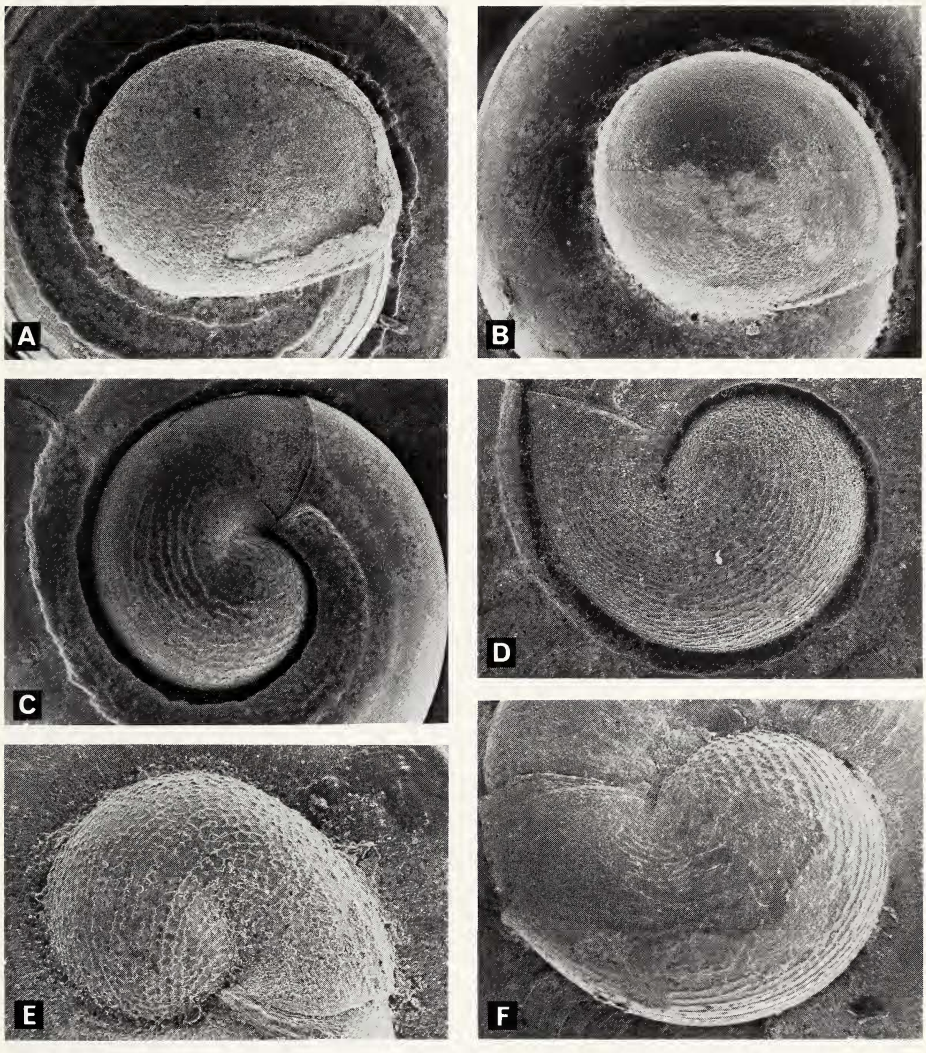


Fig. 26

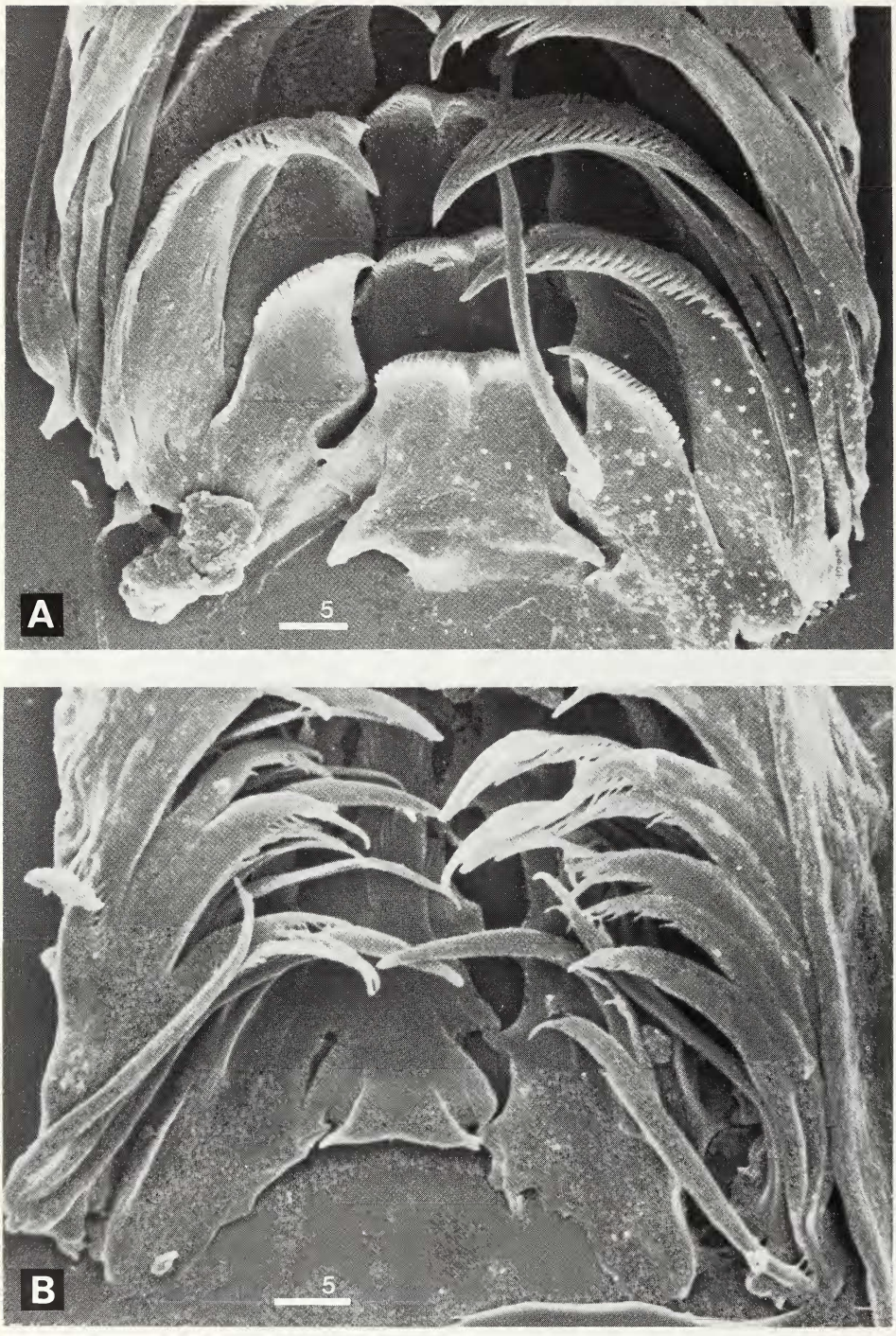


Fig. 27

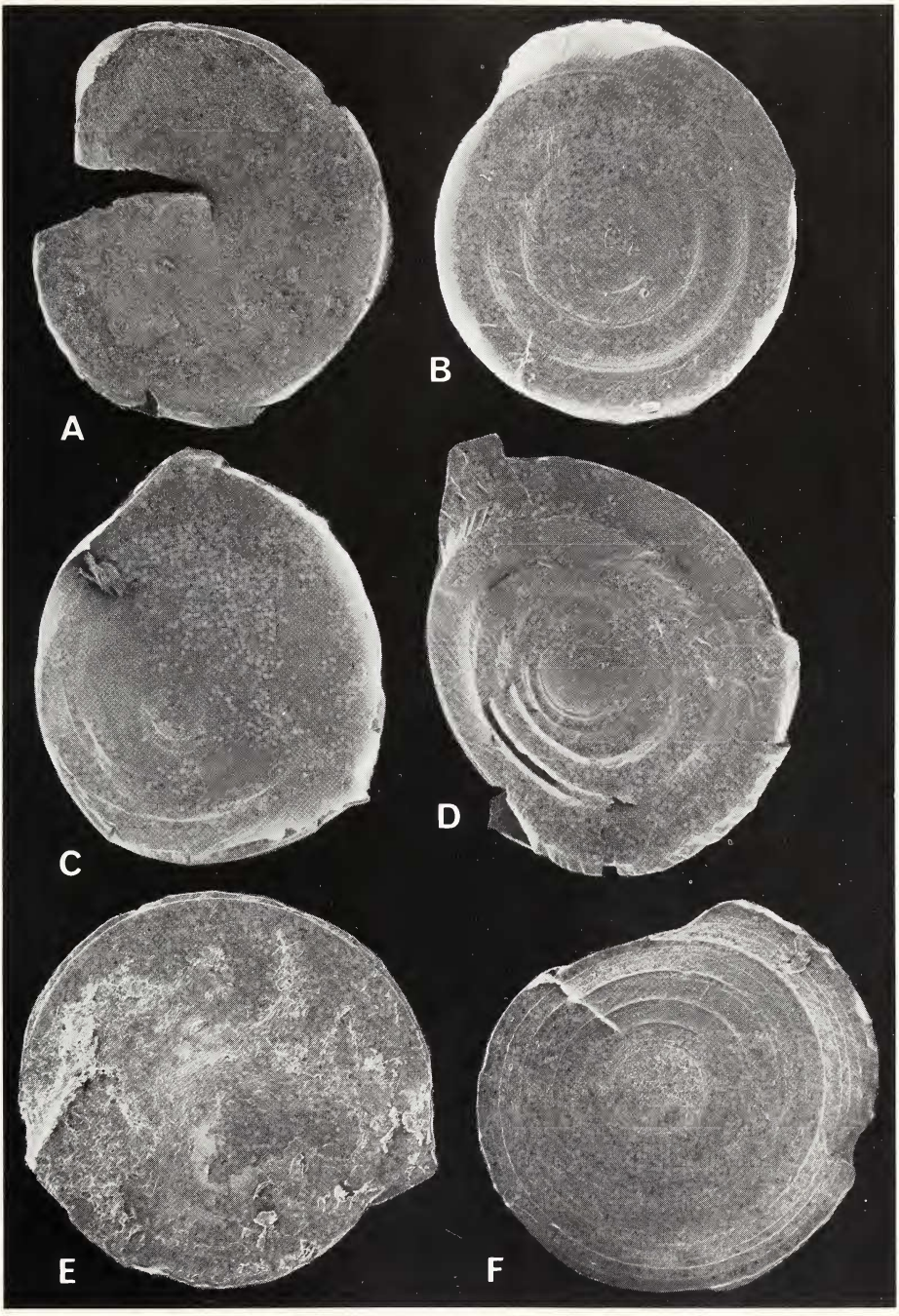


Fig. 28

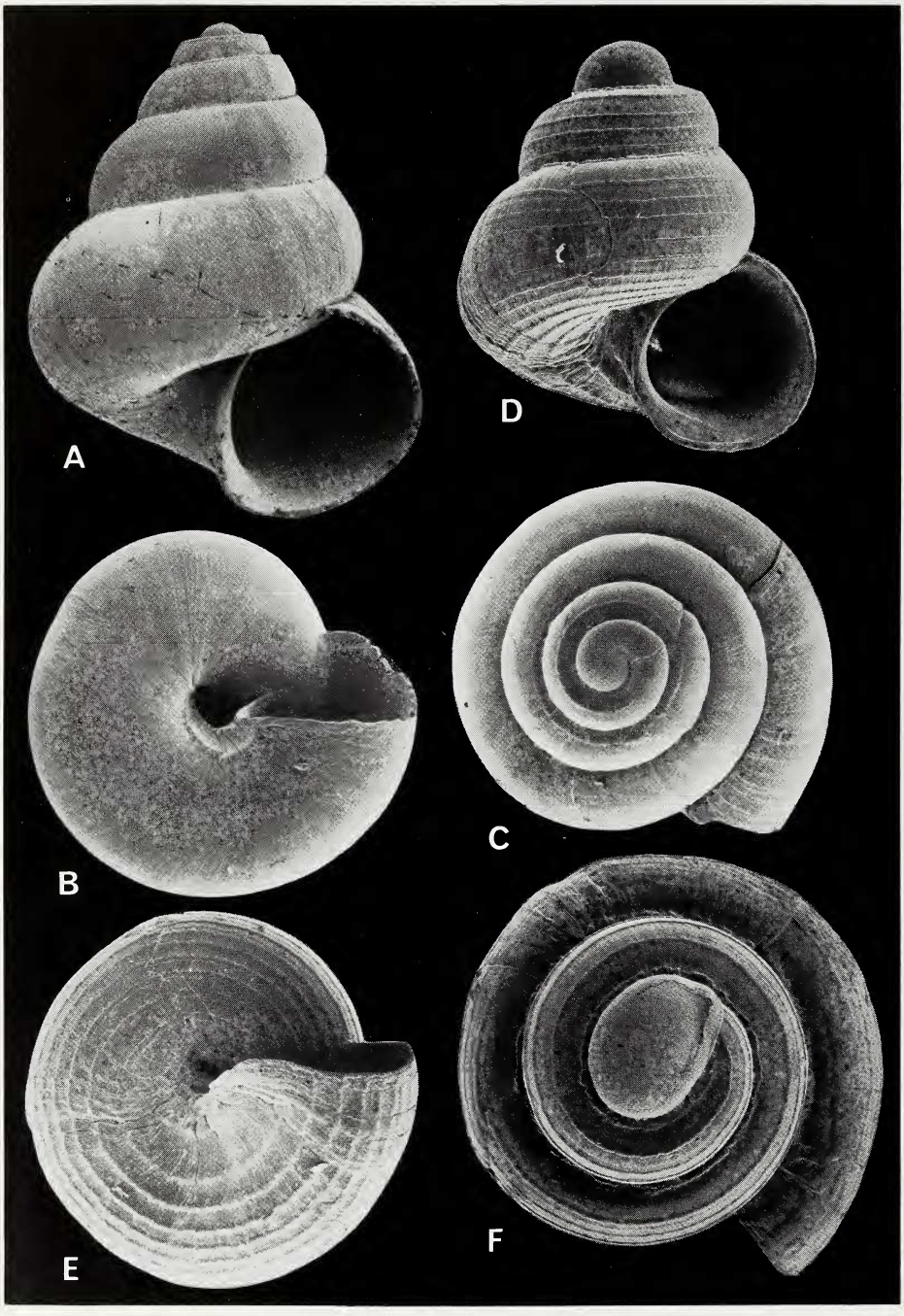


Fig. 29

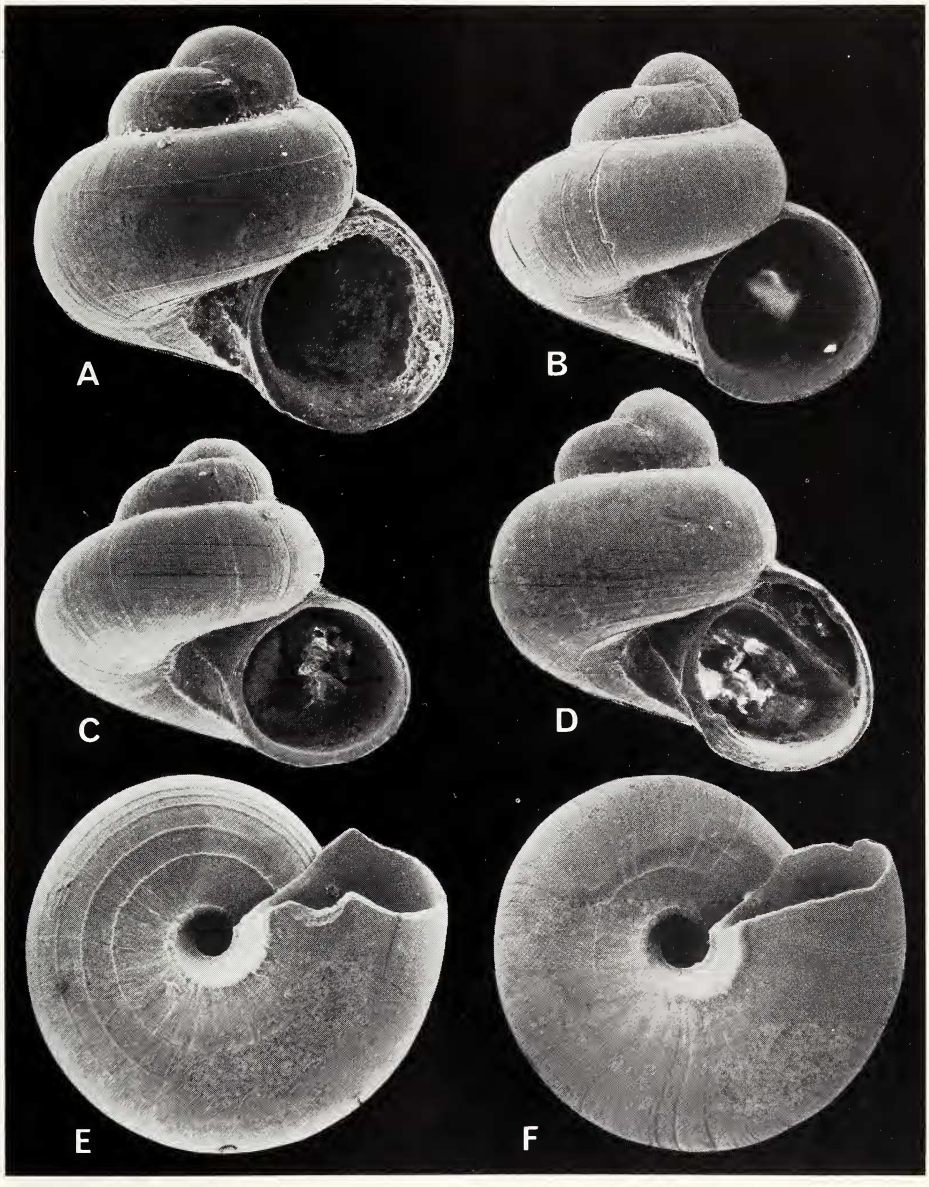


Fig. 30

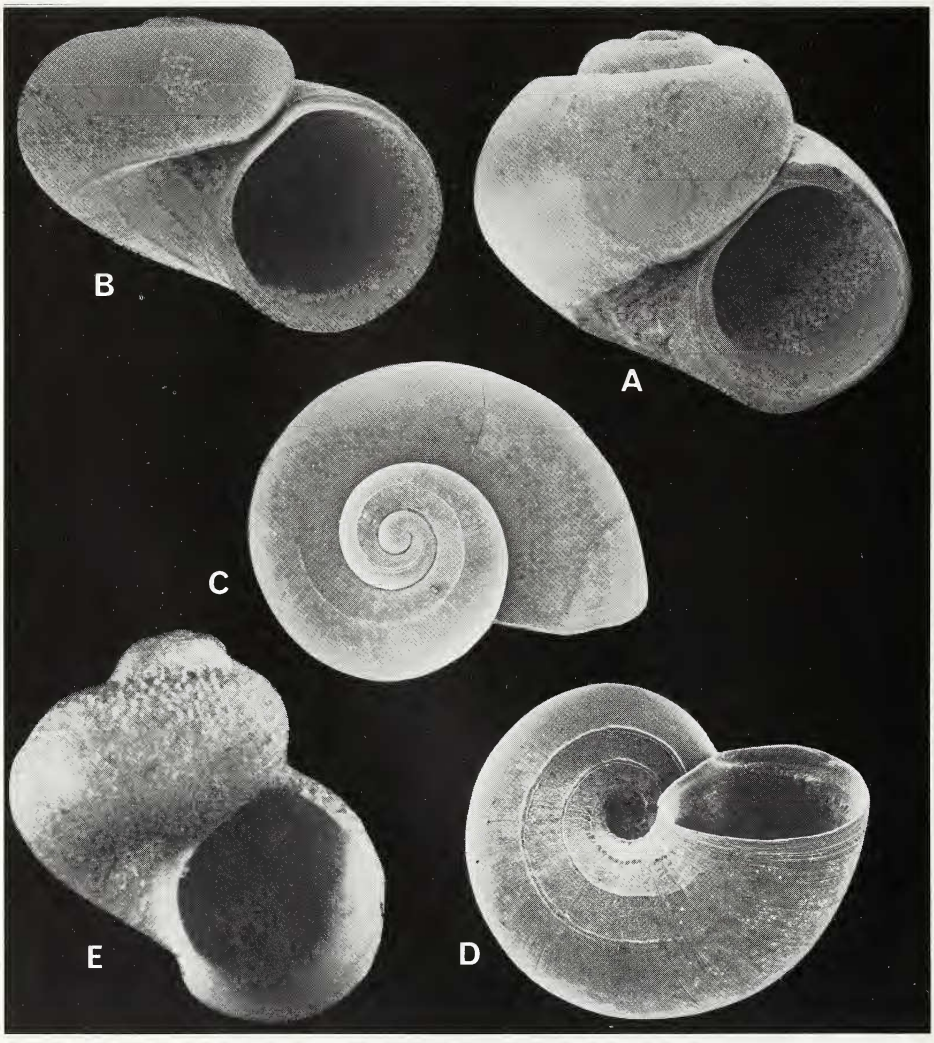


Fig. 31

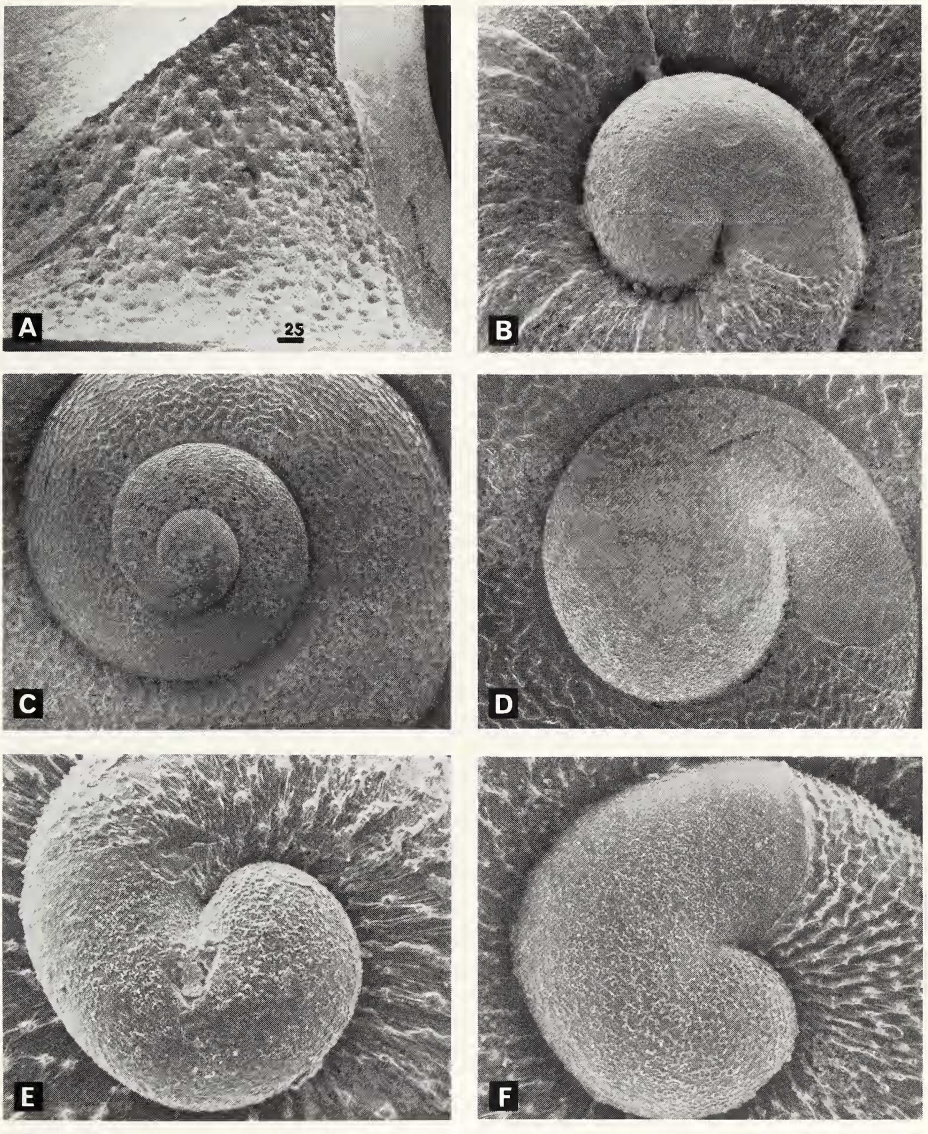


Fig. 32

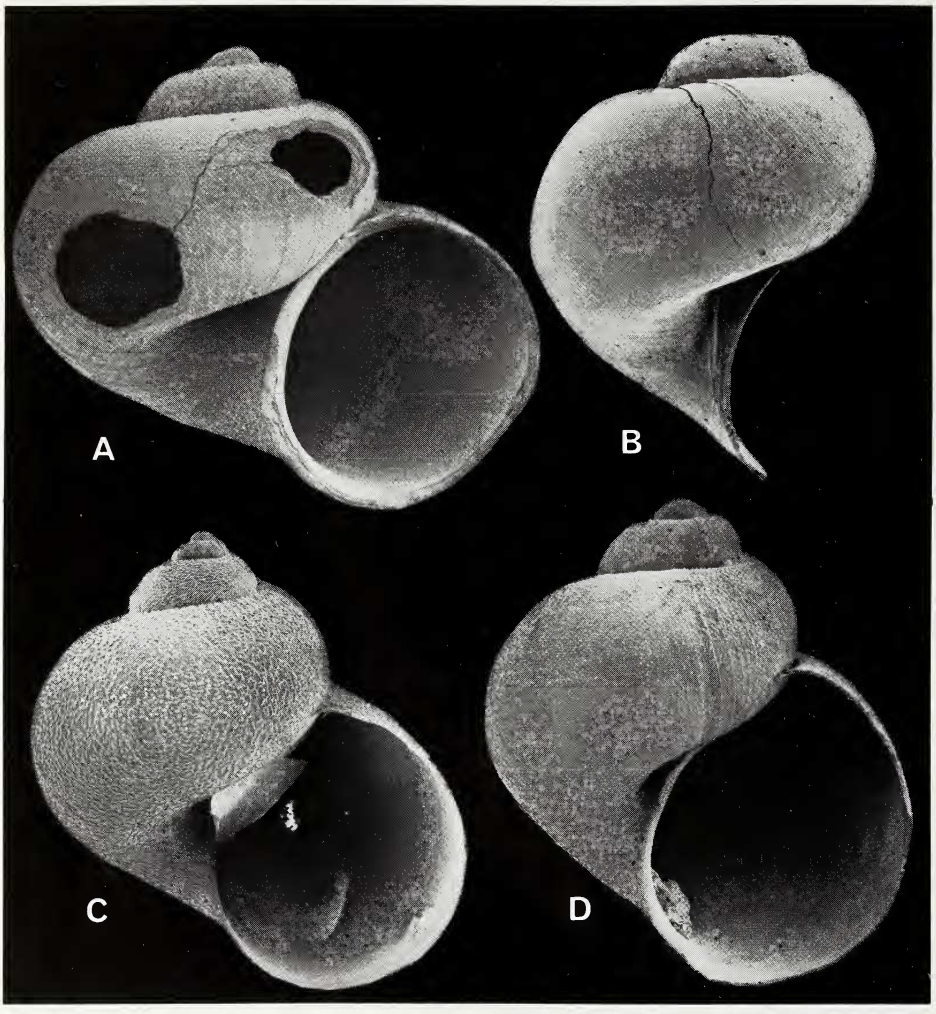


Fig. 33

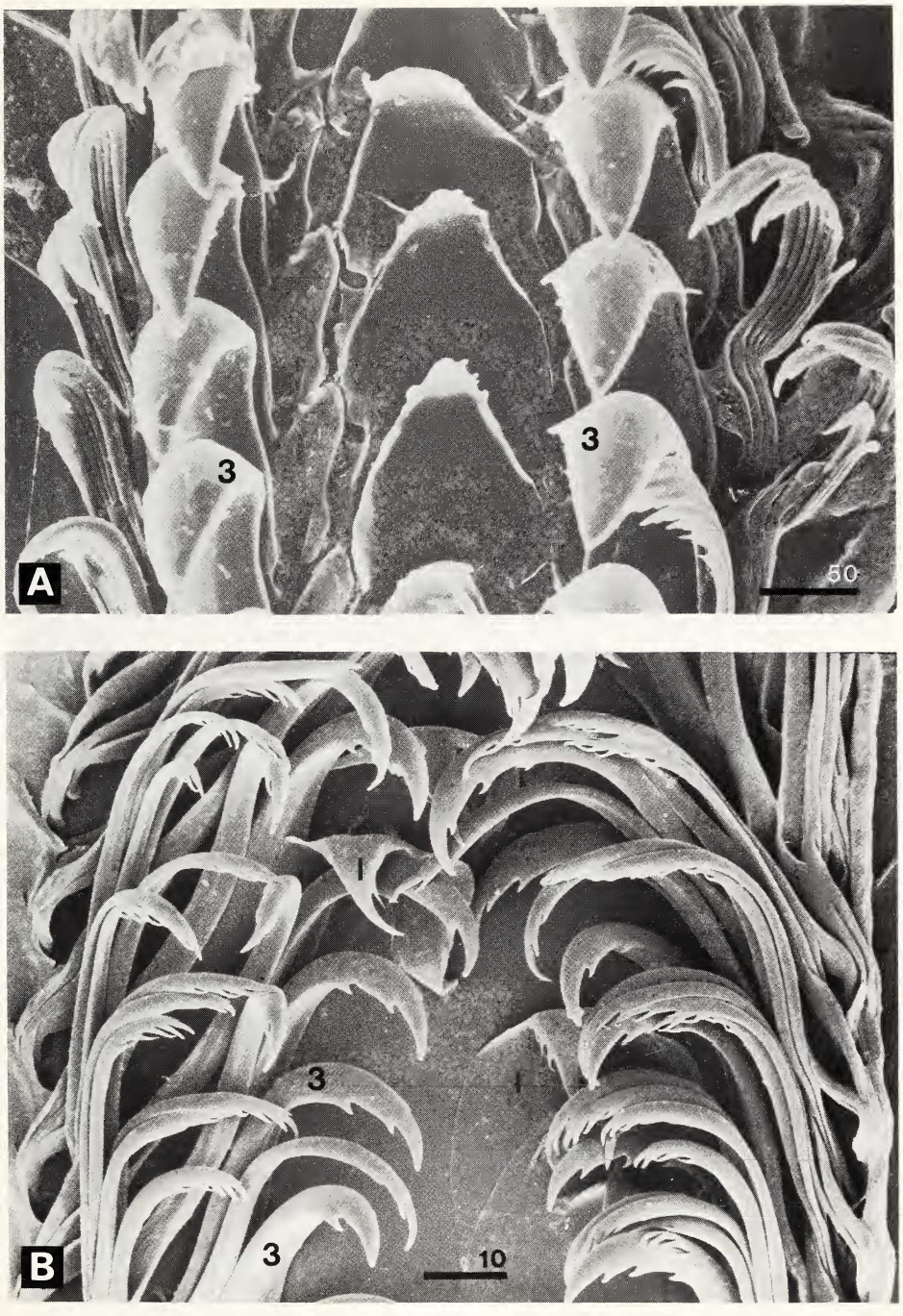


Fig. 34

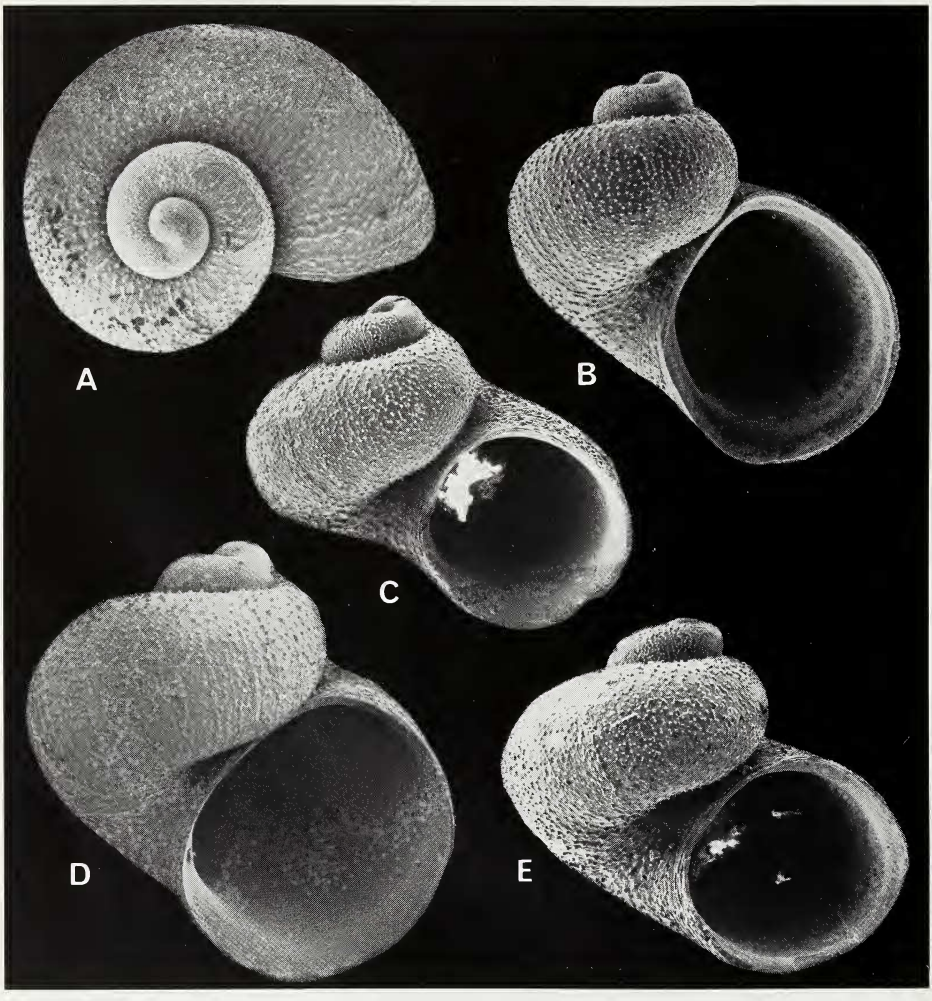


Fig. 35

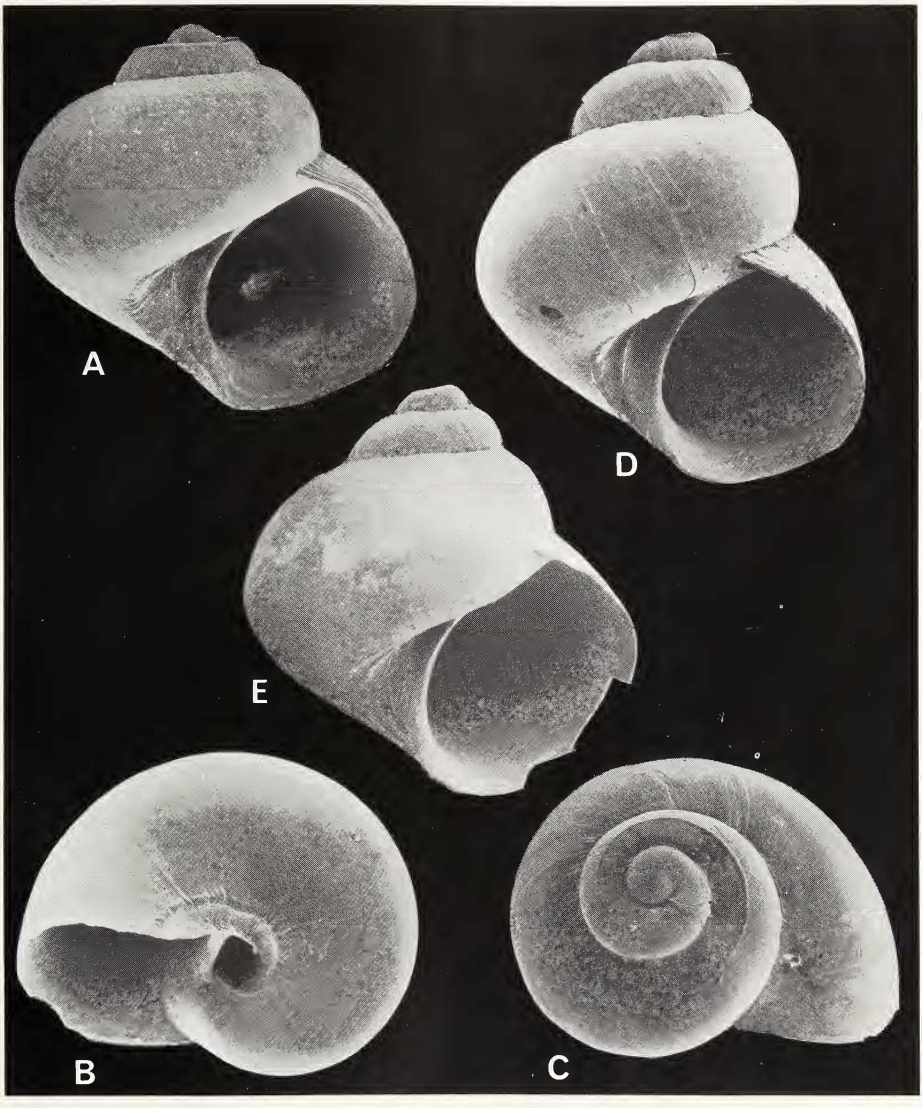


Fig. 36

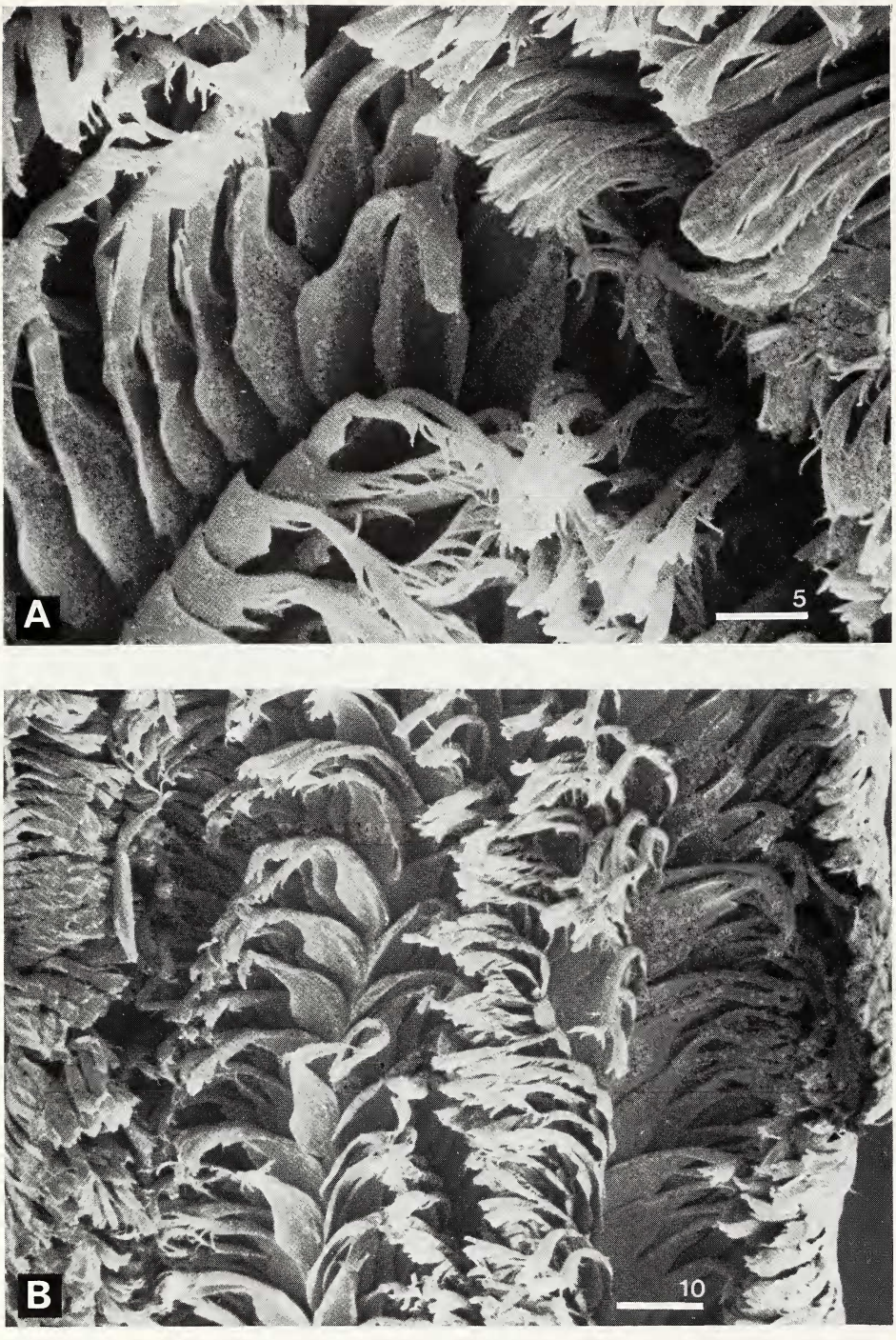


Fig. 37

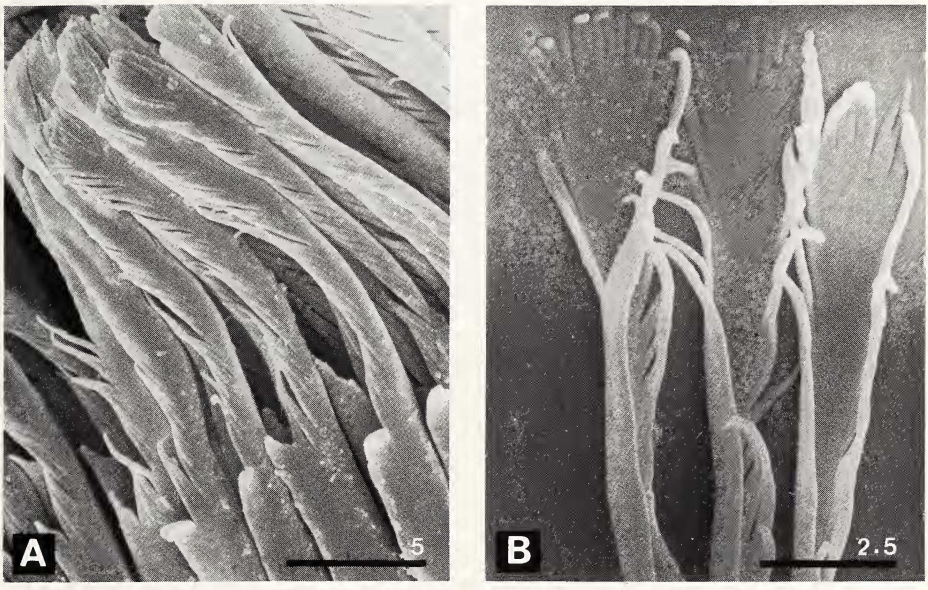


Fig. 38

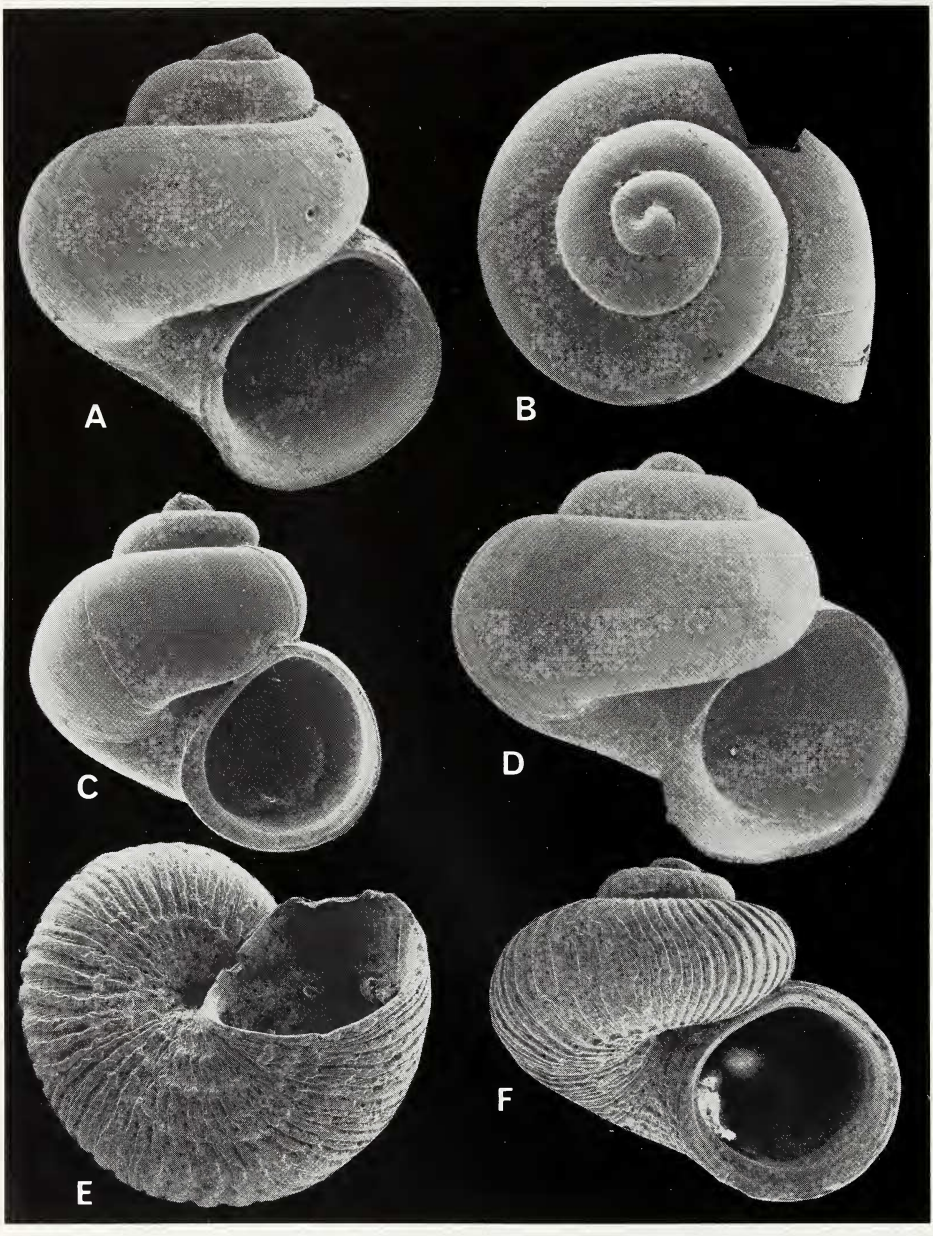


Fig. 39

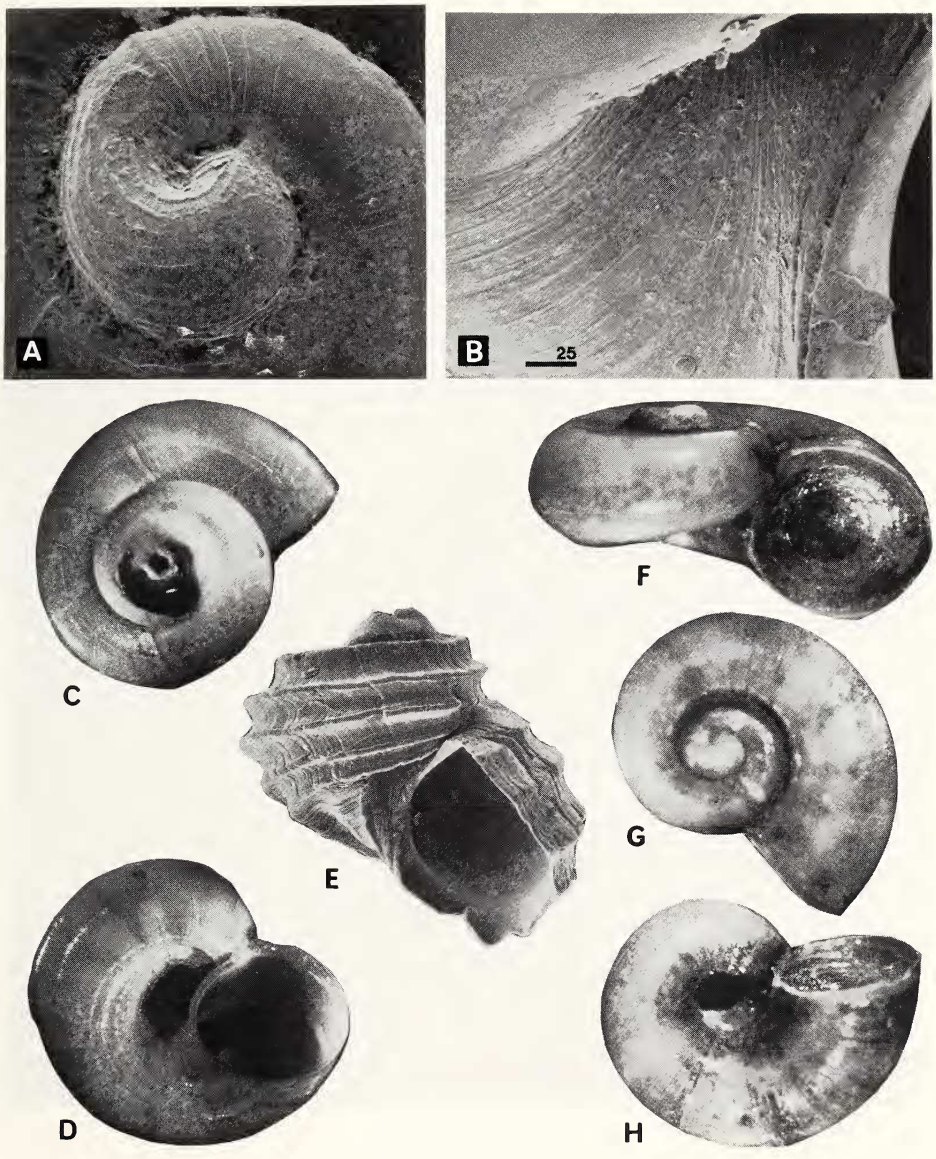


Fig. 40

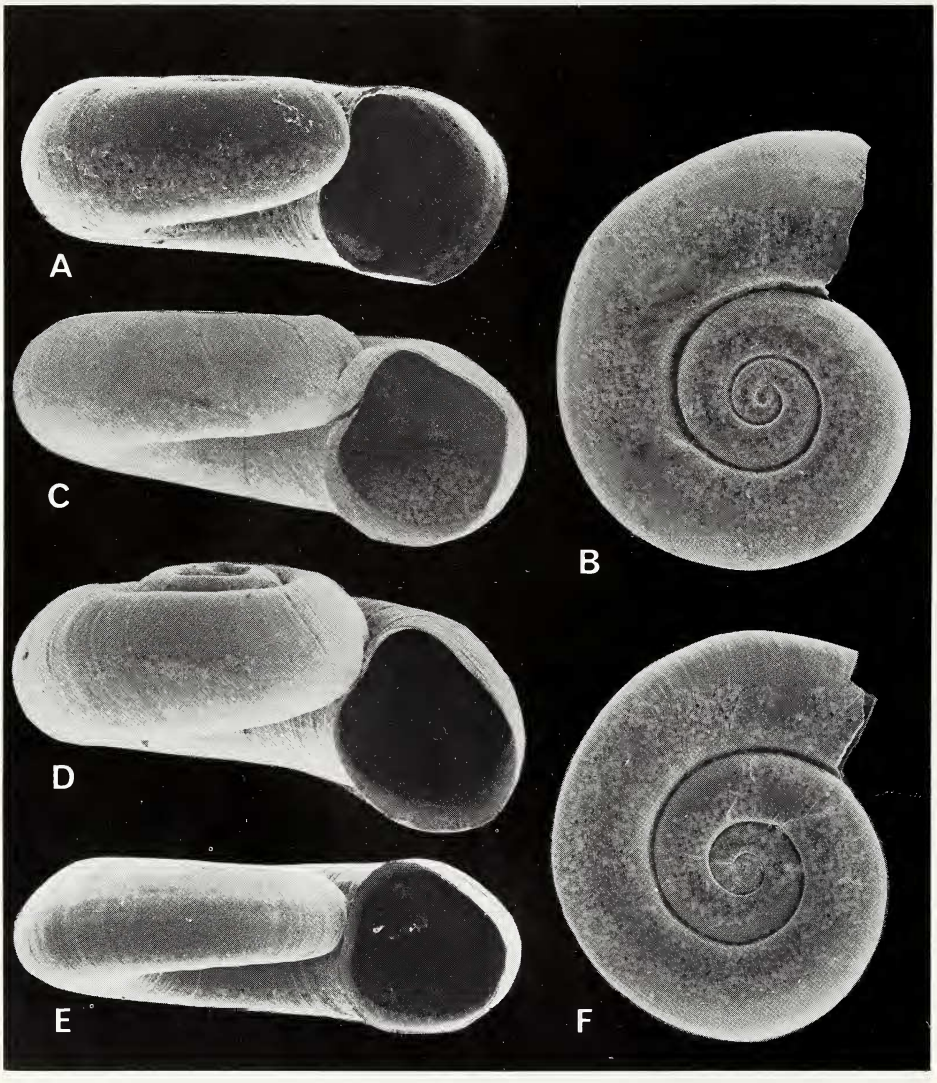


Fig. 41

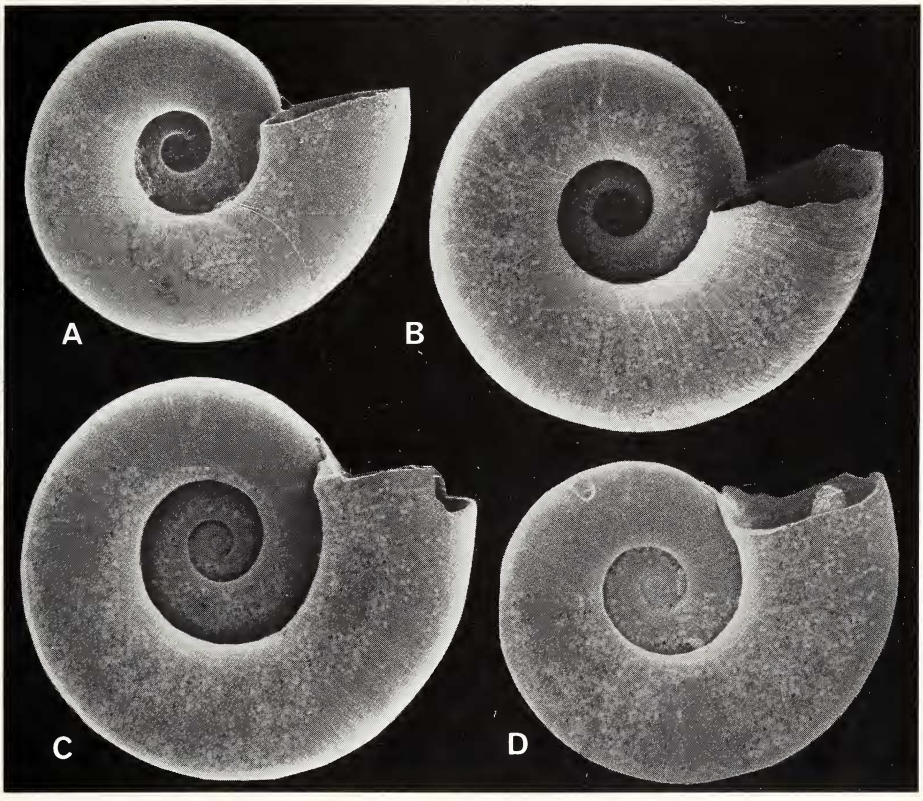


Fig. 42

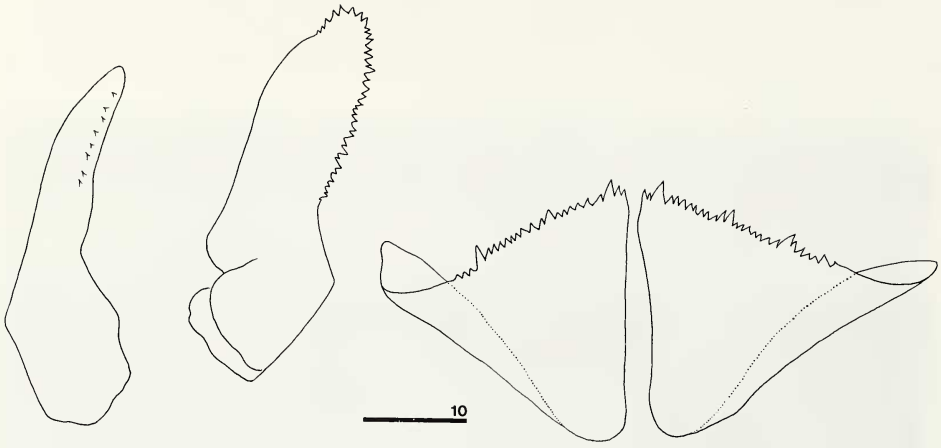


Fig. 43

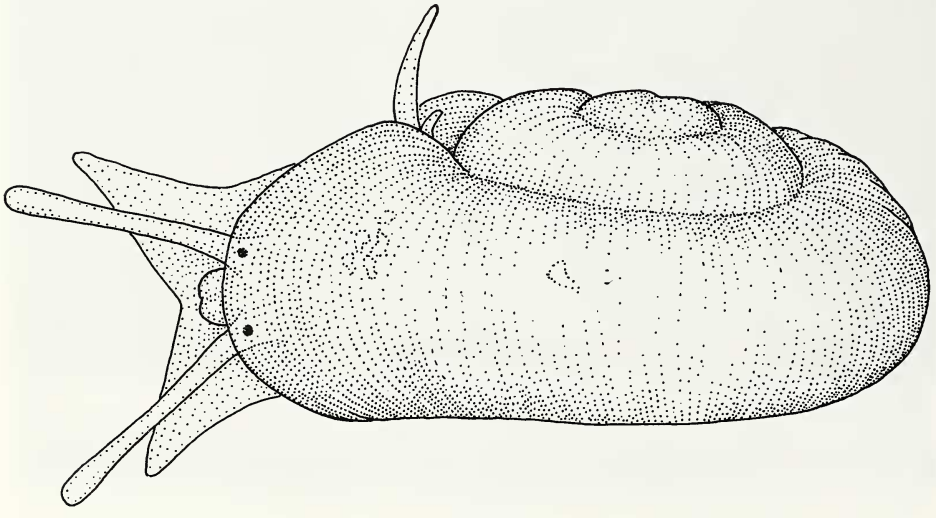

Fig. 44

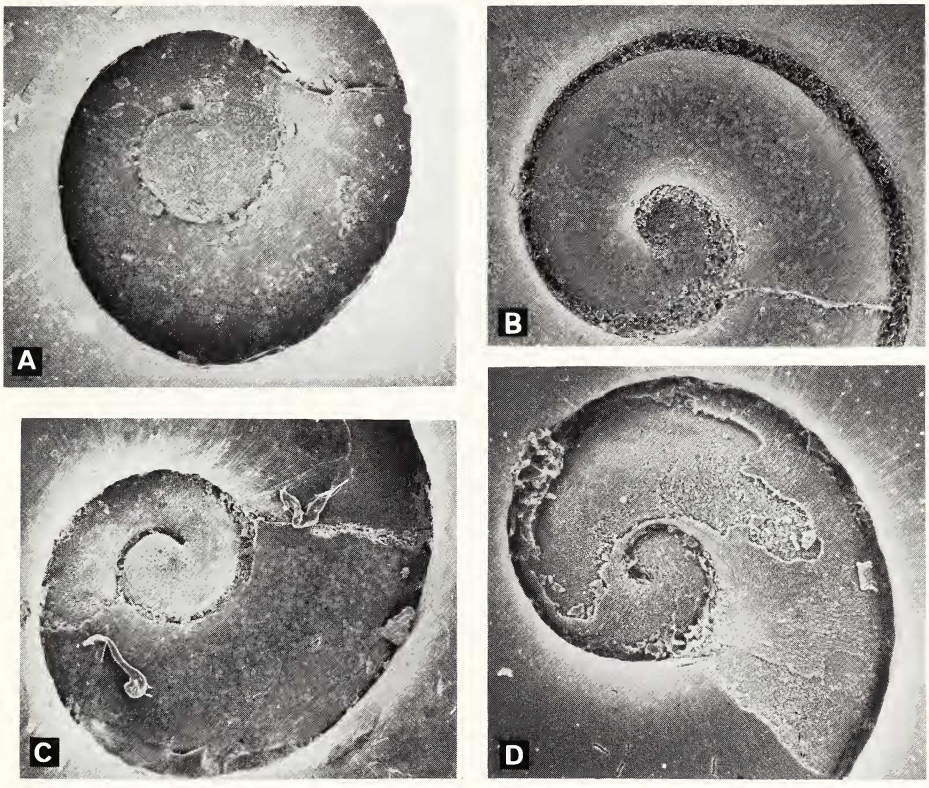


Fig. 45

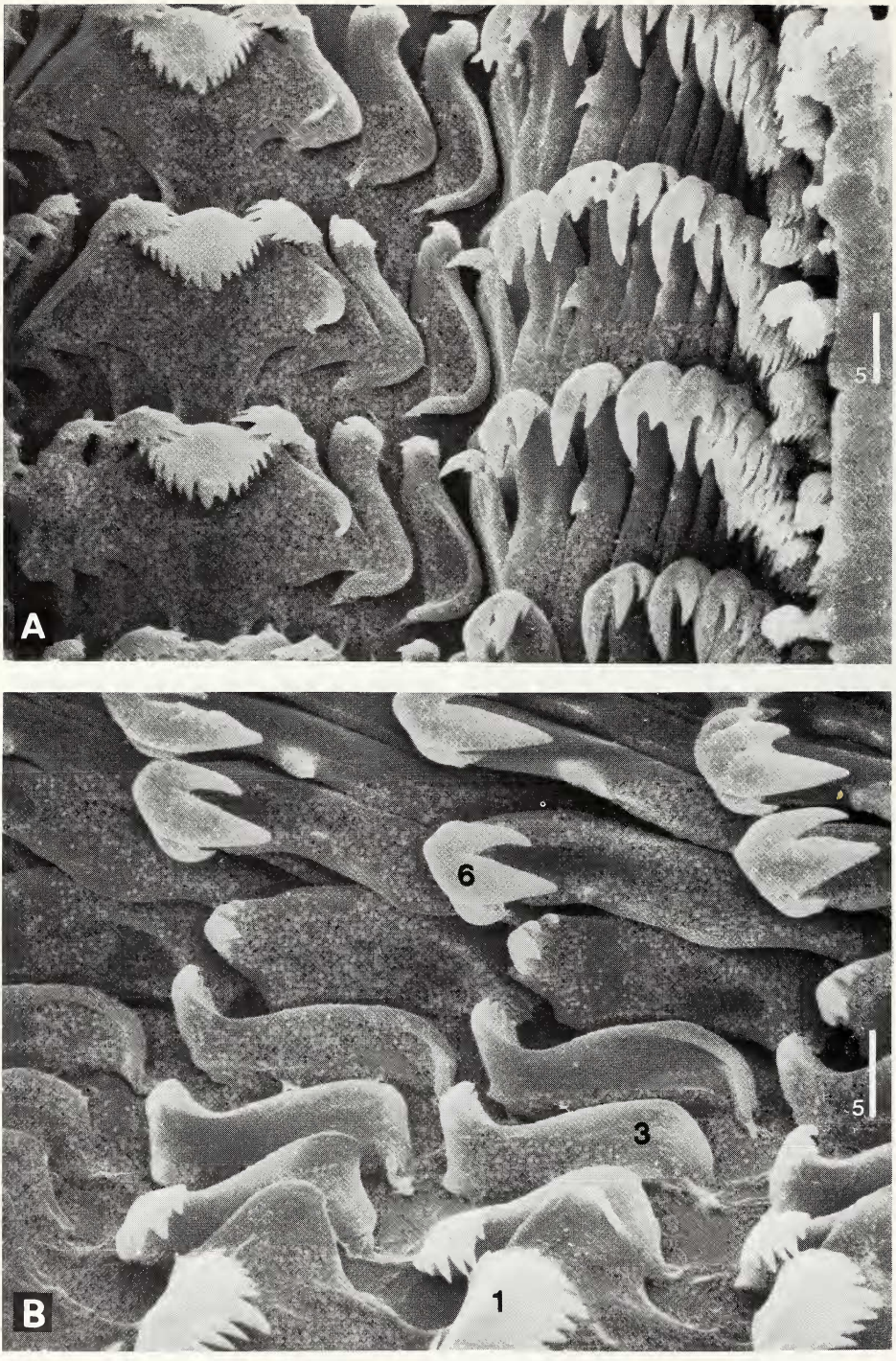


Fig. 46

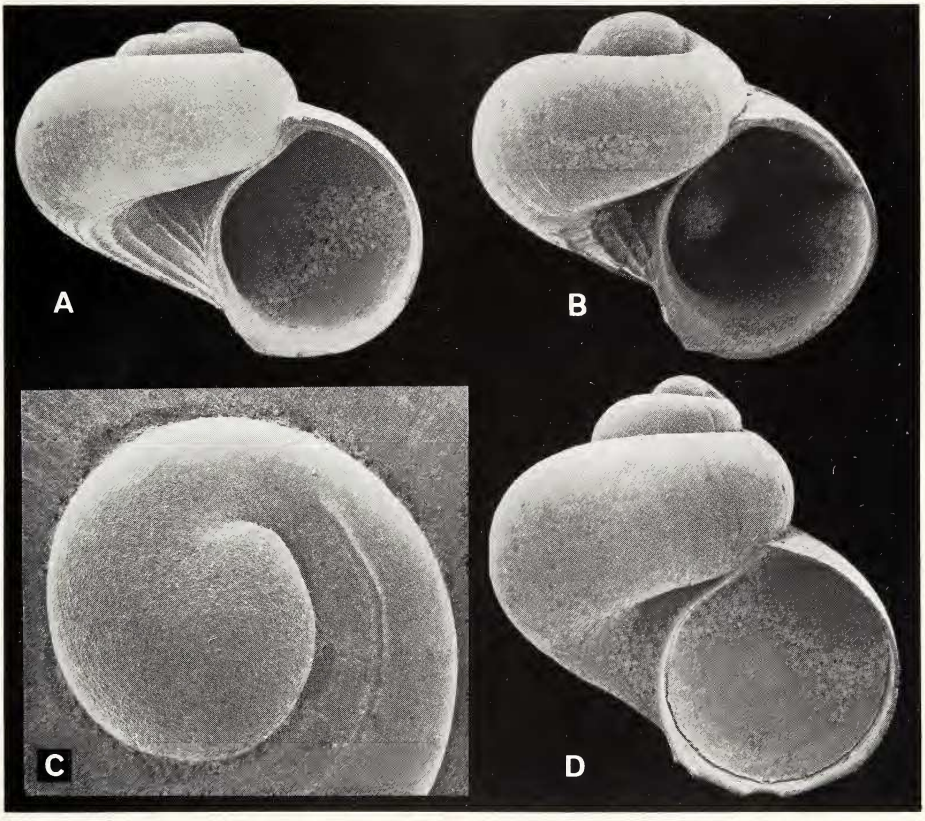


Fig. 47